February 18, 1946

STEEL

The Magazine of Metalworking and Metalproducing

ESTABLISHED 1882

HNOLOGY DEPT.

COLD ROLLED STEEL STRIP

Thomas Strip

UNCOATED AND COATED FINISHES

• ELECTRO-COATED ZINC, COPPER, NICKEL AND BRASS...HOT DIPPED TIN AND SOLDER...LACQUER COATED IN COLORS...UNCOATED PRECISION STRIP ...CARBON AND ALLOY SPECIALTIES

SPECIALIZED PRODUCERS OF COLD ROLLED STRIP STEEL

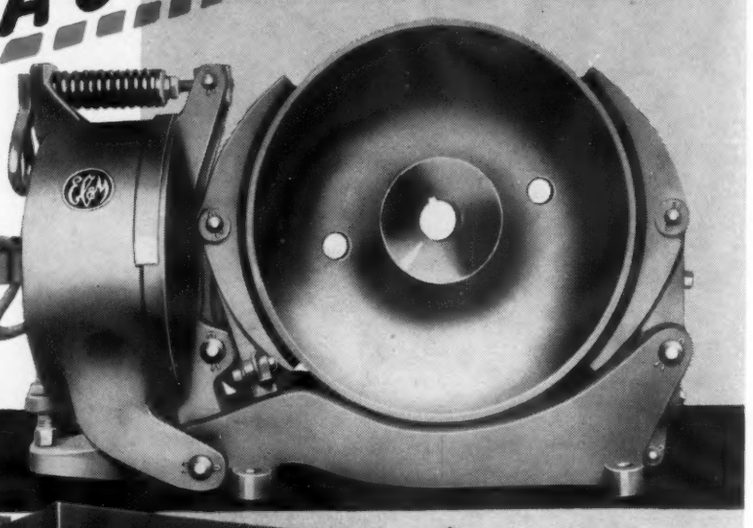
THE THOMAS STEEL COMPANY

WARREN OHIO

TYPE WB BRAKE

Solves the A-C BRAKE Problem

. . . . gives better PERFORMANCE too...



Rectifier - Unit in compact form for separate mounting on existing installations.

MANY users of a.c. motor-driven cranes, hoists and machinery are switching to the EC&M Type WB Brake with rectifier-unit. Its *high-speed performance* and *reduced up-keep* for a.c. circuits have prompted its nationwide acceptance. Repeat orders indicate standardization on the WB Brake wherever a.c. brakes are needed.

These brakes not only eliminate the laminated members required in a.c. brake design, but give quick response. High initial current insures *fast release;* automatic reduction of the holding current results in *fast setting.*

The rectifier-unit is compact and is arranged for separate mounting for existing installations. On new projects, it may be combined with the motor control panel. Bulletin 1006 gives complete details on WB Brakes for a.c. operation. Bulletin 1004-D describes them for d.c. service.

THE ELECTRIC CONTROLLER AND MANUFACTURING CO.

2698 East 79th Street — Cleveland 4, Ohio

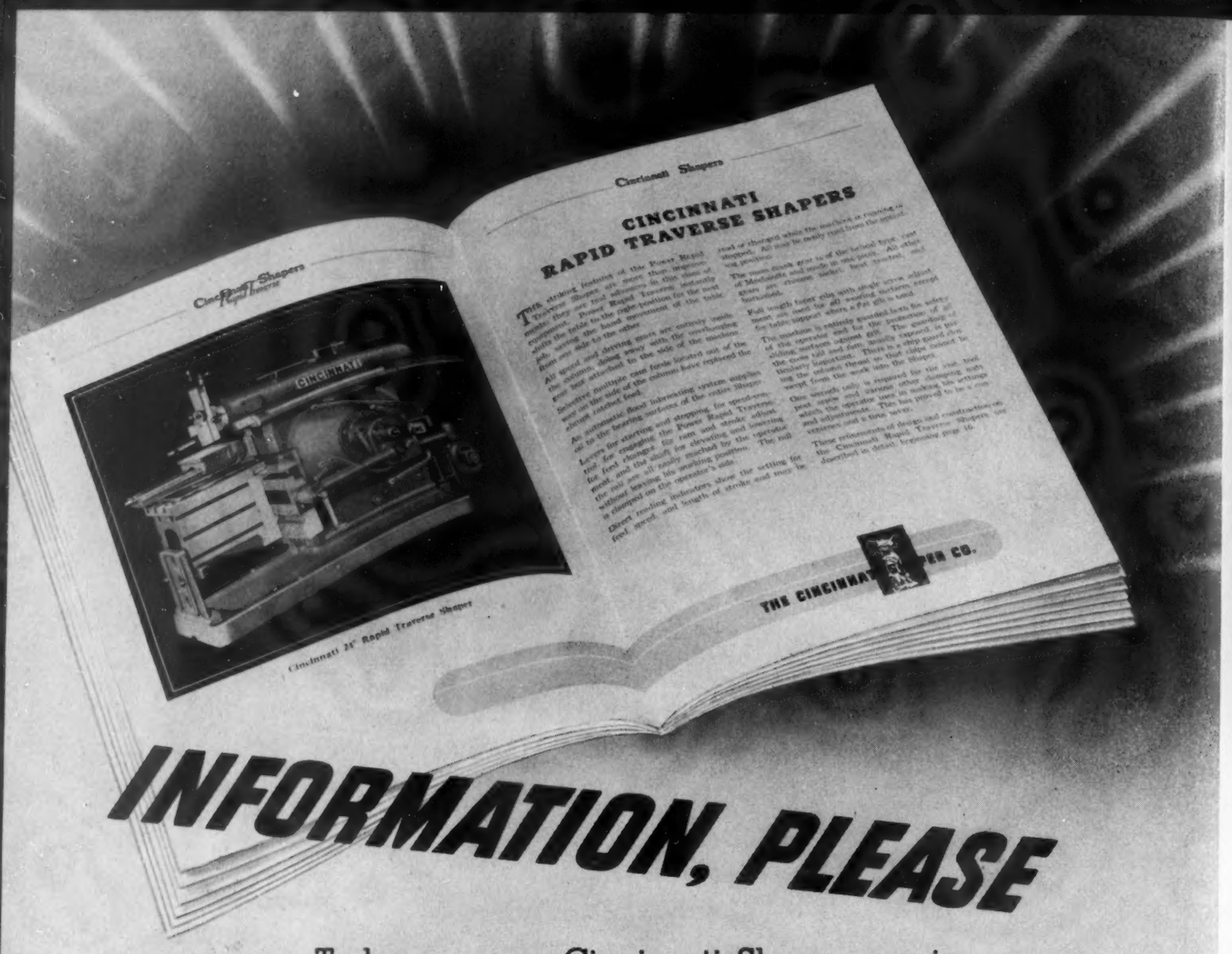
REDUCED UP-KEEP *and* BETTER OPERATION

because

No laminated magnets or plungers.
No destructive hammer-blow.
No a.c. chatter.
No coil burn-out due to shoe-wear affecting air-gap.
No motors, gears or pumps.
Has fast release and fast set.
Has ability to permit accurate inching.
Has hand release.
Has solid cast-steel magnet and armature.
Has short armature-movement.
Has thick, molded brake blocks 1/4" to 3/4" thick.

On Cranes, Hoists and Machinery ...the EC&M Type WB Brakes *give* HIGH SPEED PERFORMANCE —REDUCED UP-KEEP

BETHLEHEM
STEEL



INFORMATION, PLEASE

Today, as ever, Cincinnati Shapers are indispensable in both the large plant and the small shop. Such Cincinnati features as built-in power rapid traverse to the table, multiple cam feeds, direct reading indicators bring to the user of a single machine or of many machines an outstanding usefulness.

Write for informative book N-3 on the complete line of Cincinnati Shapers.

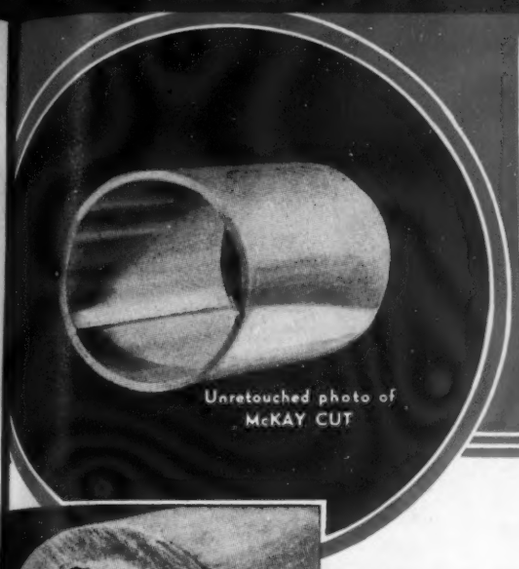
THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

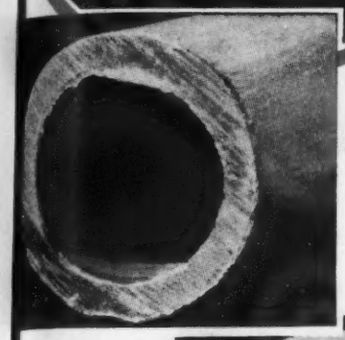
SHAPERS · SHEARS · BRAKES

McKAY

TUBE MILL ROTARY CUT-OFF

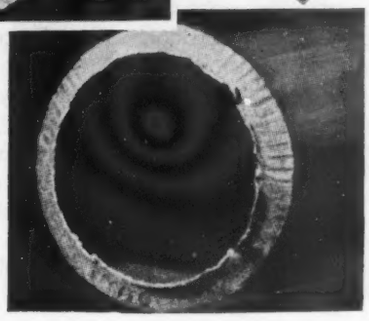


Unretouched photo of McKAY CUT



Unretouched photo of saw cut tube.

Unretouched photo tube cut by earlier type cutoff.

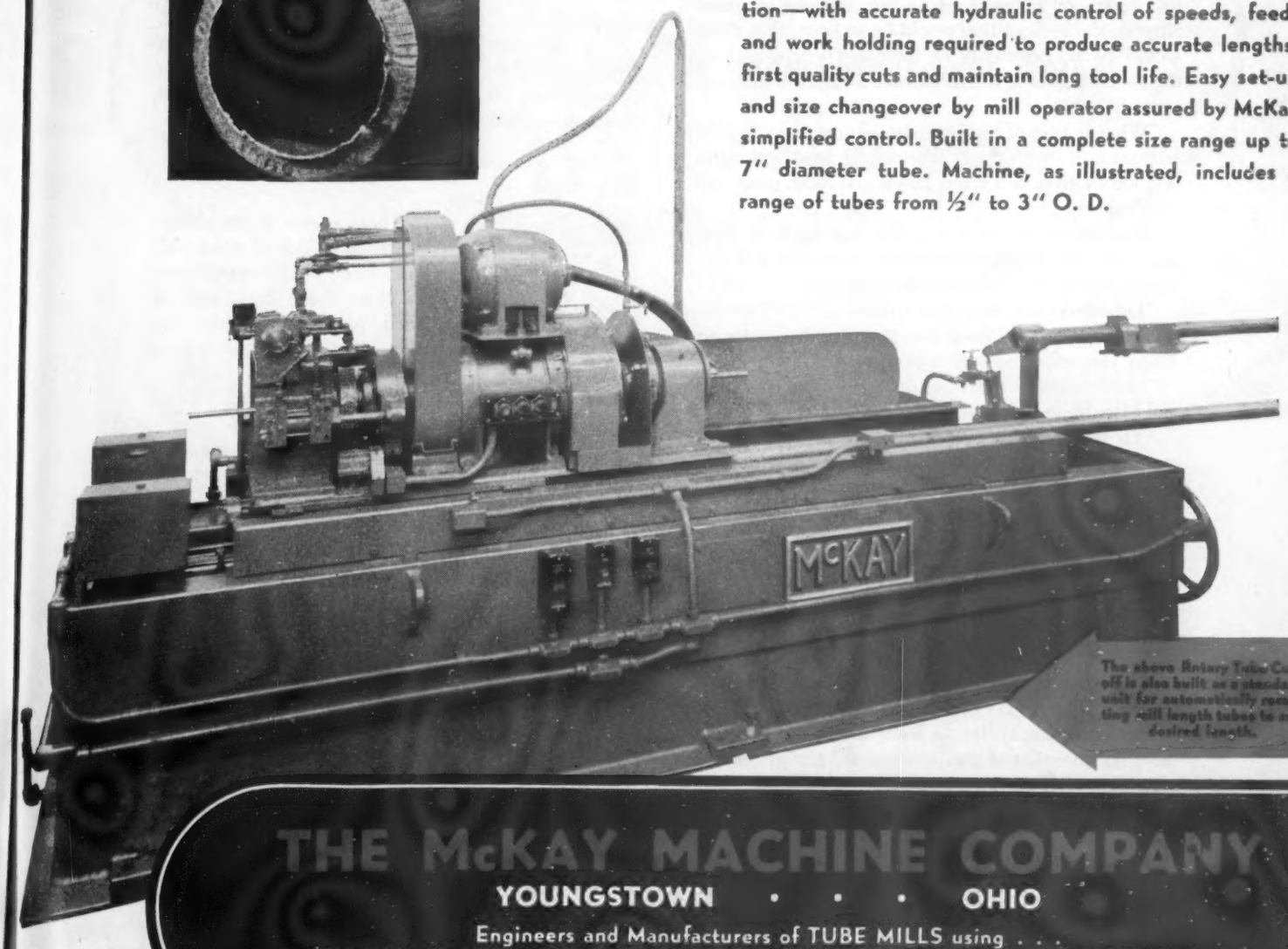


Used in line with Electric Resistance or Oxy-Acetylene welded tube mills. Is a money saver because:

1 *Accurate lengths maintained eliminate subsequent recutting operation.*

2 *Lathe quality straight end cuts are a result of the use of clamps on <u>both sides</u> of the 3 revolving cutoff tools.*

THIS unit can be used to replace older type—obsolete cutoffs in existing welded tube lines. It is furnished as standard equipment with the McKay Electric Resistance and Oxy-Acetylene welded tube mills. A completely engineered machine tool, automatic in operation—with accurate hydraulic control of speeds, feeds and work holding required to produce accurate lengths, first quality cuts and maintain long tool life. Easy set-up and size changeover by mill operator assured by McKay simplified control. Built in a complete size range up to 7" diameter tube. Machine, as illustrated, includes a range of tubes from ½" to 3" O. D.



The above Rotary Tube Cut-off is also built as a standard unit for automatically resetting cutting mill length tubes to any desired length.

THE McKAY MACHINE COMPANY

YOUNGSTOWN • • • OHIO

Engineers and Manufacturers of TUBE MILLS using . . .

ELECTRIC RESISTANCE WELD • OXY-ACETYLENE WELD • ATOMIC HYDROGEN WELD

COLD ROLL FORMING MACHINES

BEHIND THE SCENES

with Shrdlu

One Man Plea

Probably many will echo the sentiments of one plaintive David Silberman who is president of the Cap-Tin Development Corp., New York, and who in a moment of desperation purchased for himself some advertising space in the *New York Times* the other day and expounded under the heading, "A Plea from a Bewildered Small Business Man to the U. S. Government—My Government; to Labor . . . to Management," as follows:

"I manufacture zippers . . . I cannot get enough tape . . . I cannot get enough metal . . . I cannot get enough labor . . . I cannot get enough of anything except customers. If I could get enough material and enough labor, and my competitors could too, very soon between us we would make so many zippers, the competition would be so keen, that there would be no possibility of increased prices and no danger of inflation, at least so far as zippers are concerned.

"What is true of my business—zippers—is true of buttons and dresses and fabrics and steel and autos and locomotives and finger bowls and tooth picks and apple sauce.

"Production, competition, the ingenuity of management, the co-operation of labor are what will prevent inflation, not government regulation . . . SO:

"Labor—Please stop your strikes.

"Management—Please pay your employe a higher wage; remember he is your best customer.

"Government—Trust us; don't regulate us. We'll hold the line—voluntarily.

"To the average people of America—We co-operate so well in times of war for death and destruction—to fight our enemy. Why can't we in times of peace, for construction and for our mutual welfare co-operate just as well and not fight each other?

"Please, everybody, get together and let me make my zippers."

Cooling-Off Period

Taking a tip from the present labor difficulties, Senator Hogan (D) of Lynn, Mass. proposed before a legislative committee on legal affairs the other day that an extension of the "cooling-off" period between the time of filing intentions and the marriage ceremony would reduce the rising number of divorce cases. You know there's quite a similarity between the labor-management squabbles and the home front, including such things as "walk outs", "Lock outs" and the need for frequent collective bargaining, but don't you dare tell the little woman we said that.

Six Time Winner

With great chagrin we herewith apologize publicly to Handy & Harman, whose name was omitted from the list of companies run on this page recently, who received the Army-Navy "E" six times for high achievement in the production of war equipment.

Booklets Now Available

The other day one of the editors yelled at us as we were crawling down the corridor. Wanted to remind us that we have a fresh supply of those 48-page booklets on Modern Heat Treating Practice, by Mr. Seasholtz. They cost all of ½ buck per copy, and if you could use an up-to-date treatise on methods of heat treating all kinds of steel, from austempering all through the alphabet, ship us the dough & we'll ship you the books.

Silly Stuff

There seems to be almost a complete lack of good old-fashioned jokes around conventions these days, and in their place have come the silly kind, many of which strike you funny if you're in just the right mood. Good examples:

"Do you know what the pen said to the paper?" (And, of course, you say "No, what did the pen say to the paper?")

"I dot my eyes on you."

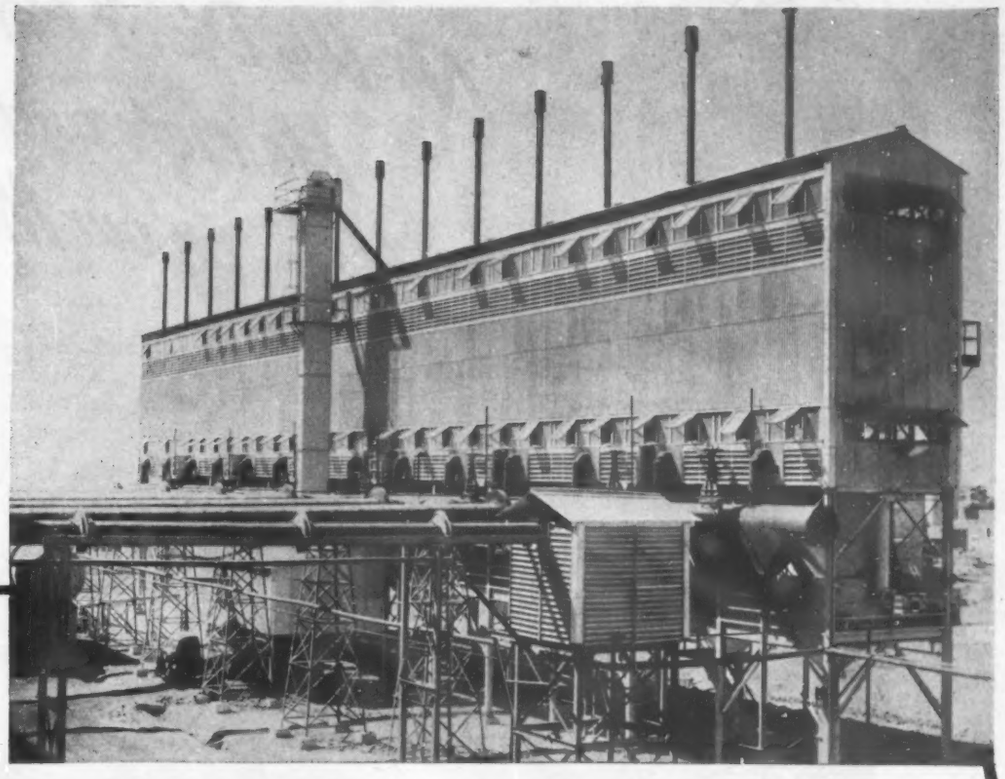
And then, before you can stop the guy he'll slide right on into—"Do you know why the ink is so blue?" (This time you refuse to answer.)

"'Cause its father's in the pen finishing out a sentence!"

That's the sort of thing we put up with all through the Metal Show, although we will admit that the rumor which was going around that Worthington Pump and International Nickel were going to merge was worth getting interested in. But after you hear that they are going to make "Pumpernickel", the only thing to do is to unobtrusively remove the hook, line and sinker and go quietly on about your business.

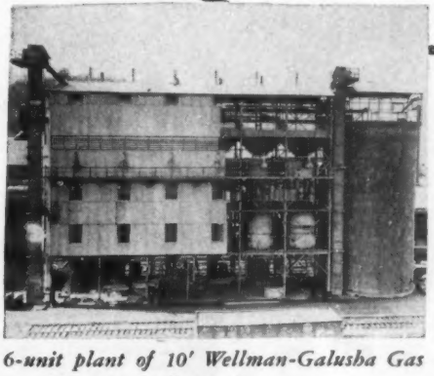
Vol. 118, No. 7, February 18, 1946, issue of STEEL, published every Monday at Cleveland, Ohio. Entered as second class matter at the post office, Cleveland, O., under act of March 3, 1879. U. S. and possessions, Canada, Mexico, Cuba, Central and South America, 1 year $6; 2 years $10; all other countries, 1 year $12. Current issues, 25c. Yearbook of Industry issue, $2.00.

(Editorial Contents—Page 55)

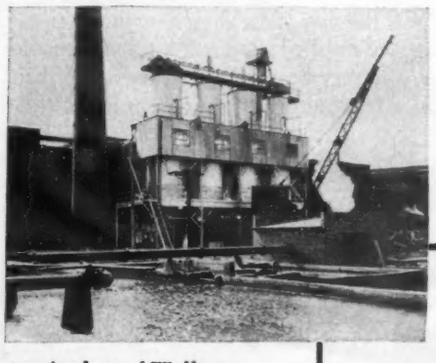


14 largest-size Wellman-Galusha Gas Generators all installed in one building

WELLMAN MANUFACTURES THE FAMOUS GALUSHA Clean Gas Generators



6-unit plant of 10' Wellman-Galusha Gas Generators



4-unit plant of Wellman-Galusha Gas Generators

The Wellman-Galusha is a fully water jacketed gas generator with exceptionally efficient rotary grates, ample fuel storage bins and provision for the generation of steam required for gas making—all incorporated in the machine itself.

The lowest priced grades of Anthracite coal, "rice" or smaller, and coke, "pea" or "breeze", can be satisfactorily and economically gasified.

WELLMAN WILL BUILD IT!

- Car Dumpers (all types)
- Ore and Coal Handling Bridges
- Gas Producers
- Skip Hoists
- Industrial Furnaces
- Coke Pushers
- Mine Hoists
- Charging Machines
- Soaking Pits
- Special Cranes (Wharf, Dry-Dock, Hammerhead, Pontoon)

THE WELLMAN ENGINEERING COMPANY

7029 CENTRAL AVENUE • CLEVELAND 4, OHIO

No-We Didn't Put Sun Helmets and Swim Suits on our Motors-but....

"Double Trouble", moaned the experts, but the Navy stood fast. "All we want", said they, "are starting motors for diesel engines that'll stand up in tropic heat. Make them waterproof too!"

Blood pressures went up, when we ran into short-circuits. Horsepower had to be high (14-22 hp) and frames extra small (1/5 standard size). To offset this, operating periods would never last more than 45 seconds.

Well, we sweated out the high temperature problem — finally licked it with a new method of induction brazing of armature coils. Result: our coil could withstand high temperatures under all operating conditions.

Swimming suits required! Next, we had to waterproof our motors to make them swimmers. So we slipped a spun cover over each unit and sealed it against a neoprene rubber gasket. They shed water like a duck!

"On the beam" was the way those diesel engineers put it when they saw the finished product. And you should have seen the way they beamed after they made their tests. We lost a few buttons off our vests too!

There's a Moral: Every time Allis-Chalmers engineering solves *special* motor problems, we discover new ways to build better standard motors for you. ALLIS-CHALMERS, MILWAUKEE 1, WIS.

A 1928

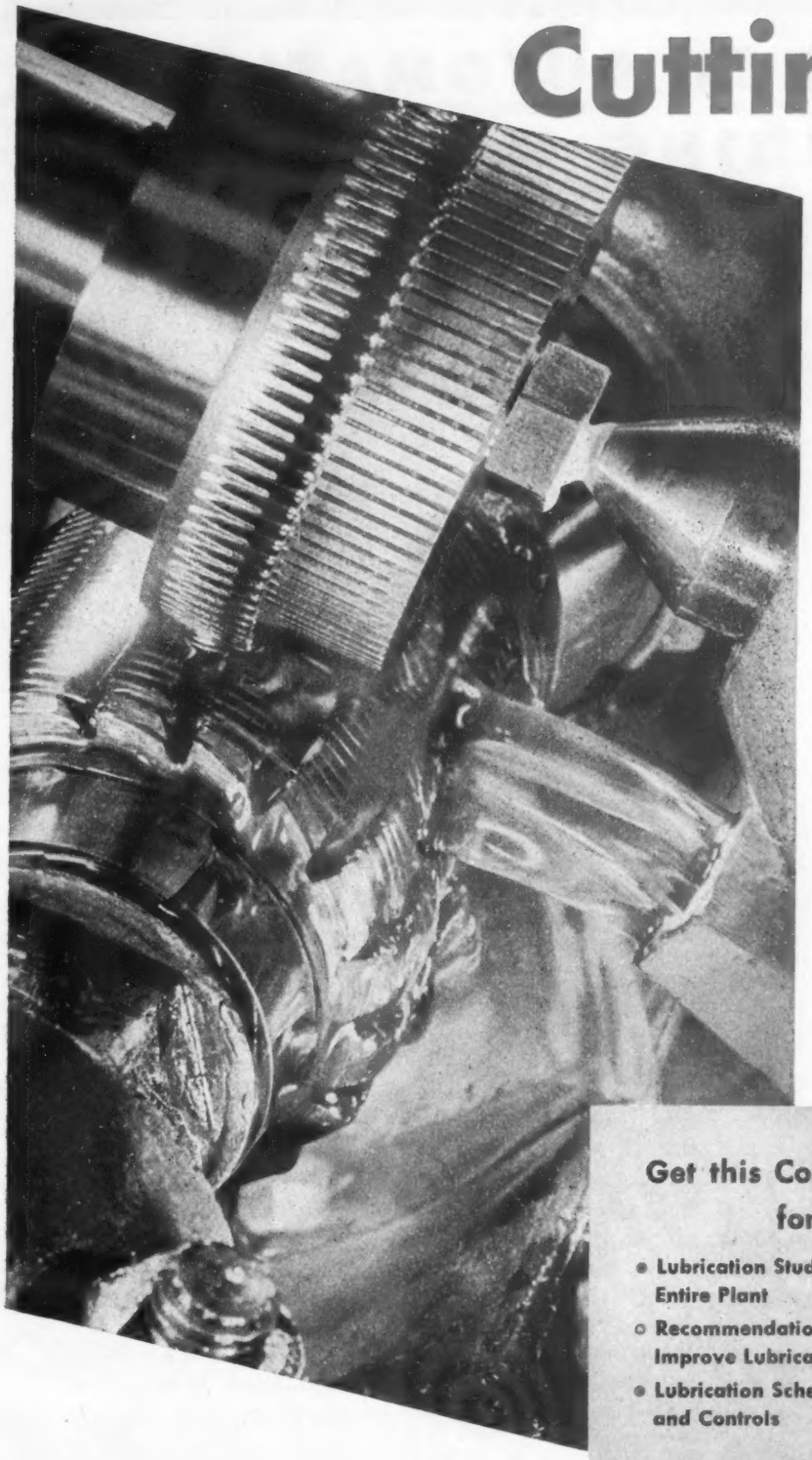
Wait 'til you see the NEW

ALLIS-CHALMERS MOTORS!

HEAR THE BOSTON SYMPHONY: *Every Saturday Evening, American Broadcasting Co.*

Get Better Visibility... and Better Work... with these

New Transparent Cutting Oils!



FROM SHOPS all over the country, facts and figures are coming in, attesting the superior performance of Socony-Vacuum's new light-colored transparent, odorless Sultran Oils.

Pictured here is a typical example, the hobbing of stainless steel (18-8) gears for precision instruments. The gears are held to tolerances of ±.0005 of an inch.

On this precision work, the shop superintendent reports far better visibility of the work in progress, an important advantage in starting the cut. He says that he is getting marked improvements in the finish, and a 20% reduction in hob wear. His operators like the new oils because there's no odor to cling to their clothing.

The same advantages are reported for virtually all other types of cutting operations. For these new oils not only assure better visibility and absence of odor, but also possess high lubricity and exceptional anti-weld properties. Try them now for smoother, more efficient production and more pleasant working conditions for your operators.

TUNE IN "INFORMATION PLEASE"
MONDAY EVENINGS, 9:30 E.S.T.—NBC

Get this Complete Lubrication Program for all your machines

- Lubrication Study of Your Entire Plant
- Recommendations to Improve Lubrication
- Lubrication Schedules and Controls
- Skilled Engineering Counsel
- Progress Reports of Benefits Obtained

Mobilgas Lubricants

Socony-Vacuum Oil Co., Inc.

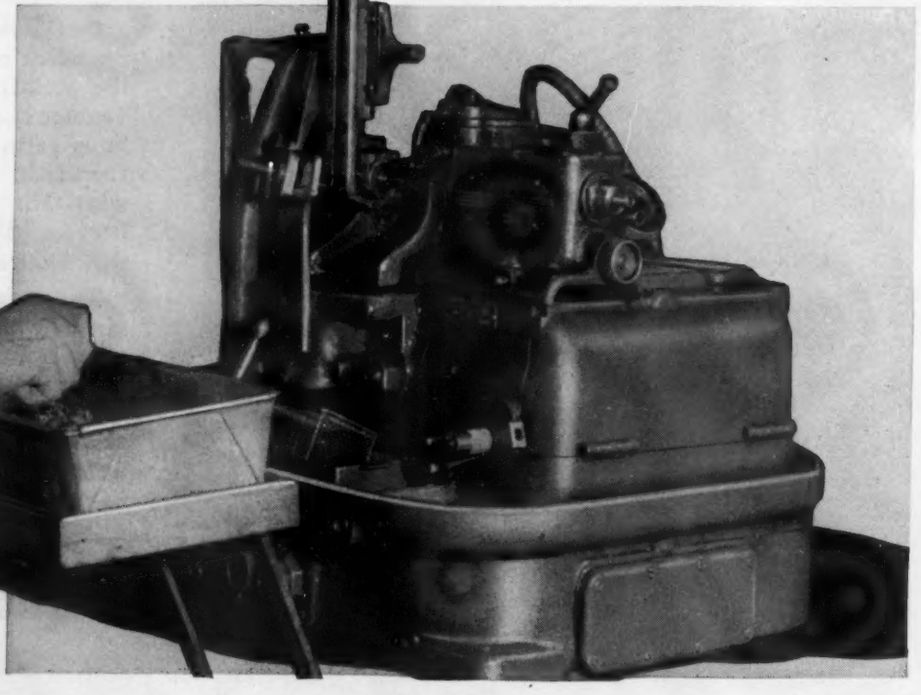
and Affiliates: Magnolia Petroleum Co. · General Petroleum Corp. of Calif.

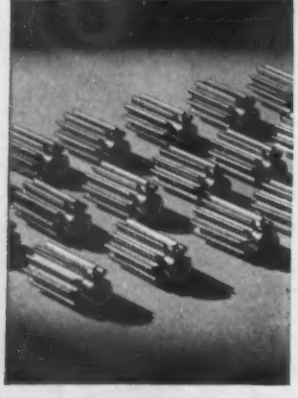
BARBER-COLMAN

HOBS • HOBBING MACHINES • HOB SHARPENING MACHINES • MILLING CUTTERS
REAMERS • REAMER SHARPENING MACHINES • SPECIAL TOOLS

TYPE "S" AUTOMATIC HOBBING MACHINE

THE IDEAL MACHINE FOR HIGH PRODUCTION HOBBING OF SMALL PINIONS AND GEARS



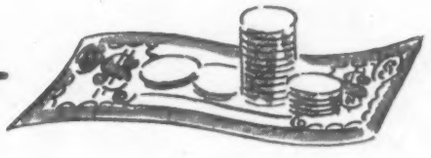


Pinions for clocks, instruments, timers, small speed reducers, light machines, small motors, and many other light-duty mechanisms can be made *fast and accurately* on the Barber-Colman type "S" Automatic Hobbing Machine. For example, the machine shown above is hobbing 10 teeth of 48-pitch clock form on free-turning brass rod blanks .440" long and .249" O.D. at the rate of *240 pieces an hour.* In this customer's plant, 11 Type "S" machines with 12-sec. cycles and 2 with 19-sec. cycles are producing a total of 290,000 pieces every week (working two 8-hour shifts, six days). Write today for our bulletin on the Type "S" Automatic Hobbing Machine and see how it can *improve production and lower costs for you.* Ask for Bulletin F-1474.

BARBER-COLMAN COMPANY

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

GENERAL OFFICES AND PLANT • 121 LOOMIS STREET • ROCKFORD, ILLINOIS, U.S.A.

Trade this for this ; save and 

No more *forcing* of sheaves. Simple wrench operates Allis-Chalmers' "Magic-Grip" — ***fastest mounting and demounting sheave on the market.*** Saves time, money.

SEE HOW QUICKLY, EASILY THIS NEW SHEAVE MOUNTS AND DEMOUNTS

1 Place sheave on shaft. Slides on smoothly because clearance is provided by expanded bushing. There's *no* hammering — *no* forcing! Complete sheave and bushing unit comes intact—ready for quick, easy mounting.

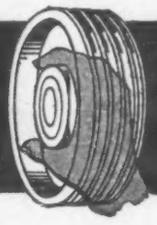
2 Align exactly, using straightedge, (It's easy with this free-sliding sheave.) Then tighten three cap-screws; sheave is locked to shaft, *grips like magic!* No set screws to damage the shaft. Write A-C for Bulletin B6310.

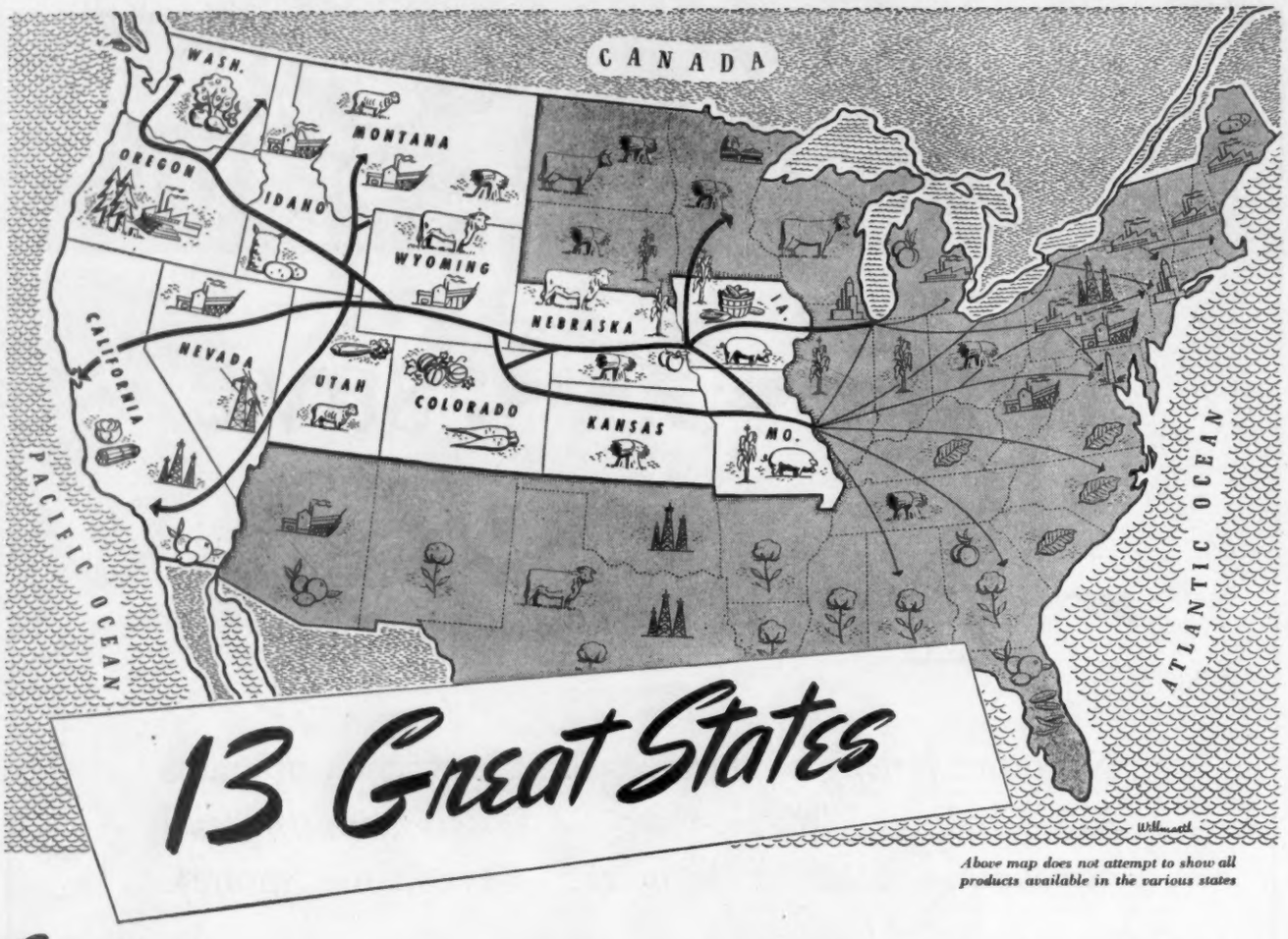
RECONVERTING?

GET THIS NEW FREE KIT!

To help you find out how your present equipment will fit into future production, A-C offers a new free "Reconversion Inventory Kit" — Fact Sheets and Check Lists to speed your appraisal of V-belt drives, electric motors, and centrifugal pumps. Applies to all makes. Call your A-C distributor or district office, or write Dept. 00, ALLIS-CHALMERS MFG., Milwaukee 1, Wisconsin.

A 1855

Allis-Chalmers Texrope "MAGIC-GRIP"  SHEAVES



Above map does not attempt to show all products available in the various states

For more than 75 years, Union Pacific has served thirteen western states . . . been a partner in their development.

This vast fertile territory is more than the breadbasket of the nation. Due to its great wealth of industrial raw materials—ore, minerals, petroleum and lumber—it might also be called the nation's treasure-chest. Rivers have been harnessed—providing irrigation and power. And there is splendid rail transportation.

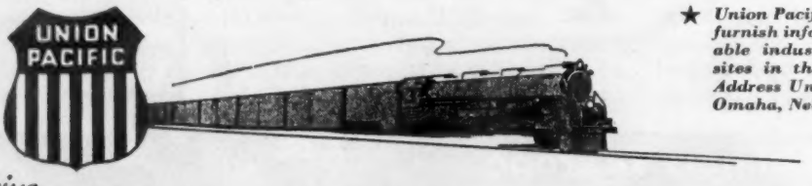
For example, in Montana, Wyoming, Nevada, Utah and other states in Union Pacific territory, there is a large source of supply of steel, iron, copper, and other industrial metals. Union Pacific has the equipment and personnel to meet all the requirements of shippers in those regions.

These thirteen western states served by the railroad are ripe for postwar expansion. They have the materials, facilities and space.

Union Pacific will continue to play its part in the future progress of this western territory by providing unexcelled freight and passenger transportation over its Strategic Middle Route.

Be Specific—
say "Union Pacific"

★ *Union Pacific will, upon request, furnish information about available industrial and mercantile sites in the territory it serves. Address Union Pacific Railroad, Omaha, Nebraska.*



The Progressive

UNION PACIFIC RAILROAD

The Strategic Middle Route

Drop Forged

FOR GREATER STRENGTH AND ENDURANCE

This huge connecting rod . . . weighing 785 pounds and measuring 50 inches in length . . . was drop forged in closed dies on giant hammers at Ladish producing greatly superior physical properties. The denser, more homogeneous structure resulting from drop forgings made under Ladish Quality Control provides improved machinability and freedom from concealed defects.

Ladish engineers are available for consultation on your present or new designs. Highest limits of strength and endurance are obtained through the use of drop forgings.

LADISH DROP FORGE CO.

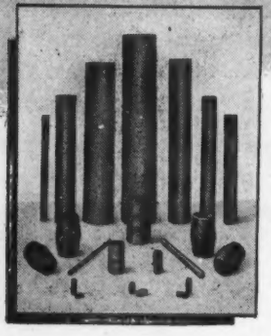
CUDAHY • WISCONSIN

MILWAUKEE SUBURB

names worth remembering . . .

★★★★★ **GIROD** for introducing the first arc-resistance furnace in 1906

★★★★★ **INTERNATIONAL** for Graphite Electrodes with High Thermal Conductivity



THE complete graphitization of INTERNATIONAL Electrodes assures quick availability of the heat produced. This property of INTERNATIONAL Graphite Electrodes means maximum service life and minimum power consumption.

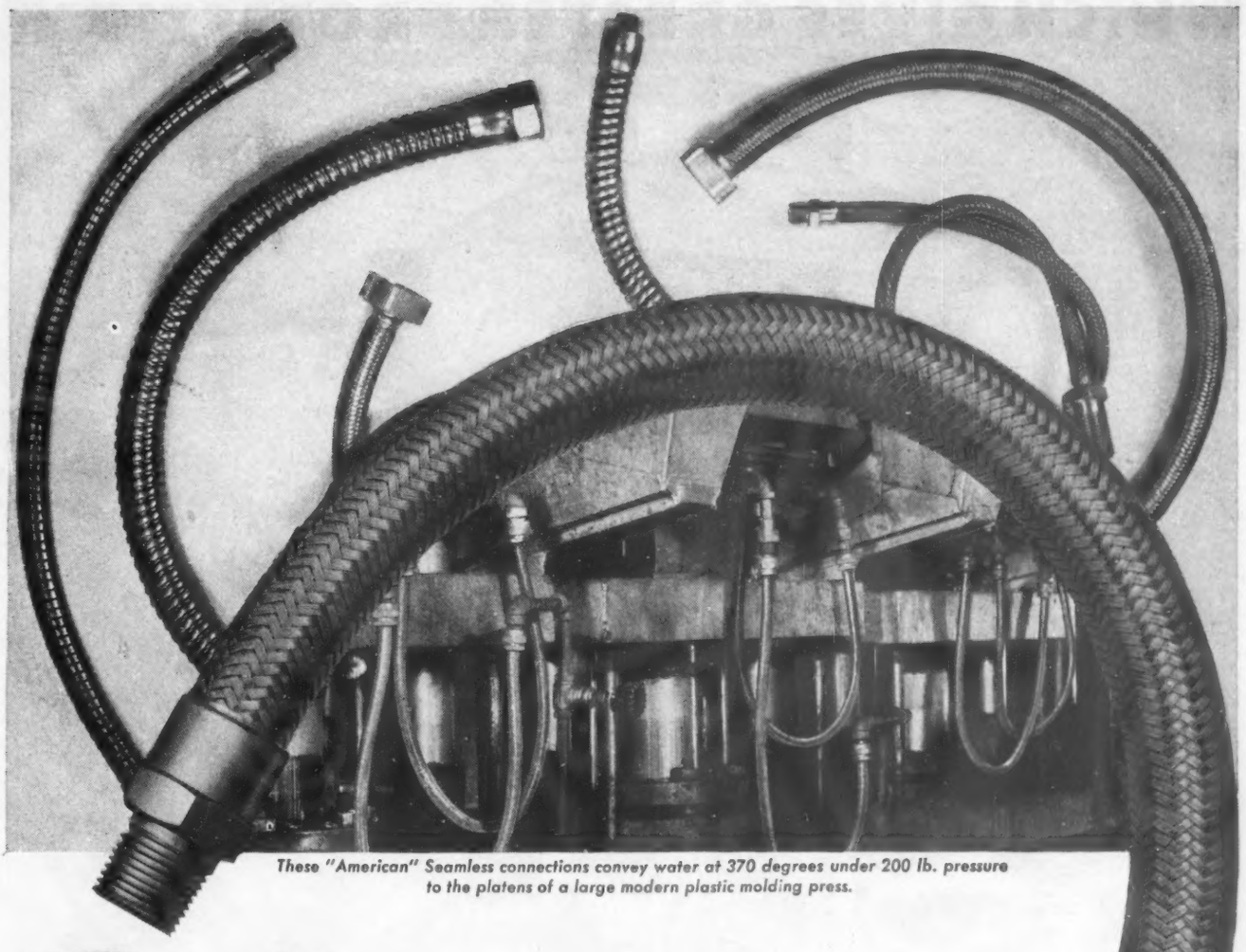
Purity, strength, high density, low electrical resistance, oxidation resistance, uniformity of structure . . . these are some of the *other* qualities of INTERNATIONAL Electrodes which have established a preference for them wherever standards are set for electric furnace efficiency.

INTERNATIONAL Graphite Electrodes have been consistently used for years by leading *producers* of fine electric furnace steels and by principal electric furnace *manufacturers* as well. These users know that the name INTERNATIONAL denotes a graphite electrode which has all the necessary characteristics for attaining lowest electrode cost per ton of steel production. Write for further details.

SPECIFY INTERNATIONAL ELECTRODES FOR—
Slow consumption • High current capacity
Low rate of oxidation • High thermal conductivity
Consistently uniform properties and dimensions
Low cost per ton of production

International Graphite & Electrode Corp.
SAINT MARYS, PA.

591



These "American" Seamless connections convey water at 370 degrees under 200 lb. pressure to the platens of a large modern plastic molding press.

Flexible...yet withstands High Pressure and Heat

A good example of the ability of American Flexible Metal Hose and Tubing to stand up in severe service is this use on a modern plastic molding press . . . where high temperature, pressure, corrosion and constant flexing combine to attack the connection.

In countless other applications "American" assemblies provide long, economical service. Carrying liquids, oils, grease, water, steam, gases and semi-solids, they absorb vibration, compensate for misalignment and allow for movement of parts.

An American Flexible Metal Hose or Tubing assembly can be engineered to meet practically any requirement. For detailed information, write for Publication SS-50.

46343

ANACONDA *American* METAL HOSE

THE AMERICAN BRASS COMPANY

AMERICAN METAL HOSE BRANCH

General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

WHICH GIVES GREATER PROTECTION-

SHIPPING TRADE SUPERSTRONG MARK CONTAINERS REG. U.S. PAT. OFF.

Size and thickness do not determine strength. Much depends on type and quality of materials, and skill in construction.

SUPERSTRONG boxes and crates—"Bound with Steel"—have less weight and occupy less valuable space, yet have all the strength to stand up under the toughest shipping conditions. They really give you protection . . . plus!

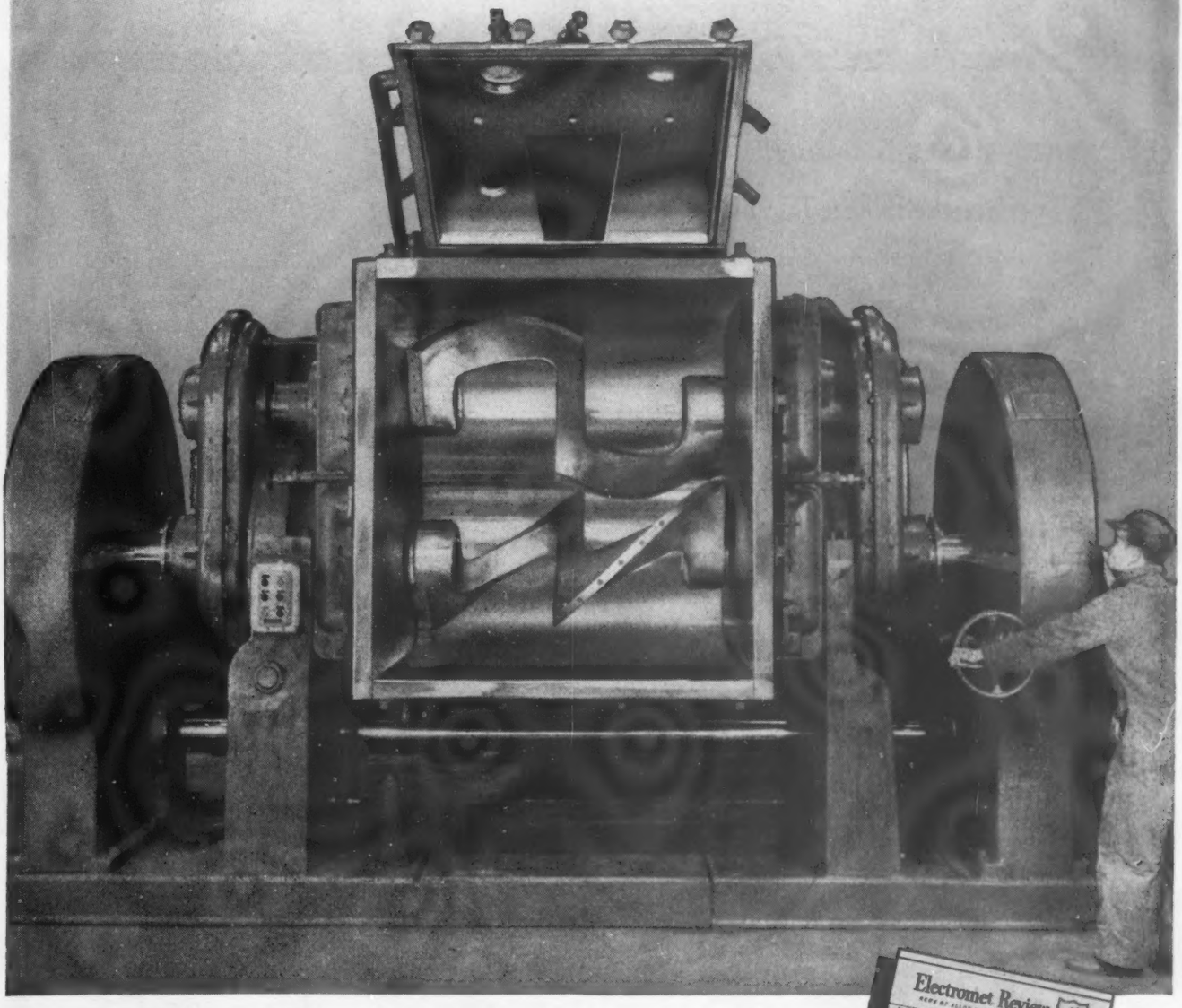
RATHBORNE, HAIR AND RIDGWAY COMPANY

7440 WEST 21st PLACE • CHICAGO 8, ILLINOIS

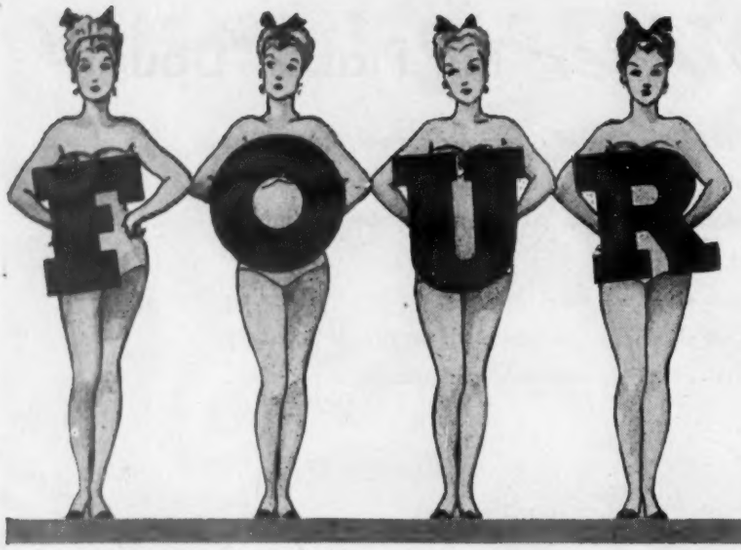
Stainless Steel Mixer For Plastic "Dough"

This giant mixing unit, with arms and bowl of stainless steel, is used to knead synthetic resins into plastic "dough." Stainless steel is used because it is extremely resistant to corrosion and is easy to clean, thereby helping to insure the purity of the product.

The same qualities that make stainless steel first choice for this mixing unit are important in all kinds of chemical equipment, from tiny laboratory forceps to huge distillation units—in fact, wherever corrosion is a problem.



Other uses of stainless steel are described in ELECTROMET REVIEW, published by ELECTRO METALLURGICAL COMPANY, a Unit of UNION CARBIDE AND CARBON CORPORATION. ELECTROMET does not make steel, but produces the ferro-alloys used in its manufacture. If you need this complimentary publication, write to ELECTRO METALLURGICAL COMPANY, 30 East 42nd Street, New York 17, N. Y.



answers to questions about NITRALLOY

the hardest steel surface known

...one of the easiest steels to get

Q. WHO MAKES *Nitralloy?*

A. These are the licensed manufacturers of Nitralloy steels:

Allegheny Ludlum Steel Corp.....Watervliet, N. Y.
The Babcock & Wilcox Tube Co.....Beaver Falls, Pa.
Bethlehem Steel Co.....Bethlehem, Pa.
Carnegie-Illinois Steel Corp.....Pittsburgh, Pa.
Copperweld Steel Co.....Warren, Ohio
Crucible Steel Co. of America.....New York, N. Y.
Firth Sterling Steel Co.....McKeesport, Pa.
Republic Steel Corp.....Massillon, Ohio
Rotary Electric Steel Co.....Detroit, Mich.
The Timken Roller Bearing Co.....Canton, Ohio
Vanadium-Alloy Steel Co.....Pittsburgh, Pa.
Atlas Steels Limited.....Welland, Ont., Canada

Q. WHO CARRIES *un-nitrided Nitralloy in bar stock?*

A. You can get un-nitrided Nitralloy from these warehouses:

Crucible Steel Company of America
Cleveland, Ohio; Newark, N. J.; Detroit, Mich.
Edgecomb Steel Company, Philadelphia, Pa.
A. Milne and Company
745 Washington St., New York City
Joseph T. Ryerson & Son., Inc.
Chicago, Ill.; New York, N. Y.

Q. WHO DOES NITRIDING?

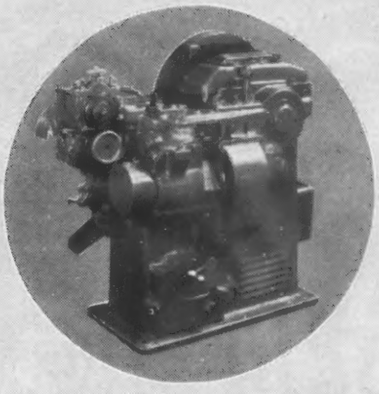
A. If you do not have your own nitriding equipment, these firms can nitride for you:

Commercial Steel Treating Corporation
6100 Tireman Ave., Detroit, Mich.
Lindberg Steel Treating Company
218 North Laflin St., Chicago, Ill.
Link-Belt Company
2045 W. Hunting Pk. Ave., Philadelphia, Pa.
Metlab Company
1000 E. Mermaid Lane, Philadelphia, Pa.
New England Metallurgical Corporation
9 Alger Street, Boston, Mass.
Pittsburgh Commercial Heat Treating Company
3710 Liberty Ave., Pittsburgh, Pa.
The Queen City Steel Treating Company
Cincinnati, Ohio
Wesley Steel Treating Company
1312 W. Pierce St., Milwaukee, Wis.
N. A. Woodworth Company
1365 Jarvis Ave., Detroit, Mich.
Ontario Research Foundation
43 Queens Park, Toronto, Ont., Canada
Salkover Metal Processing Company, Inc.
3416 Borden Ave., Long Island City, N. Y.
J. W. Rex Company (Successor to Rex and Erb)
Lansdale, Pa.
The Lakeside Steel Improvement Company
5418-20 Lakeside Ave., Cleveland 14, Ohio
Temperature Processing Div., Pyrometer Service Co.
228 River Road, No. Arlington, N. J.
Metro Heat Treat Corp.
466 Broome St., New York 13, N. Y.

Q. *Who can supply* TECHNICAL DATA?

A. **Technical data on Nitralloy is as easy to get as Nitralloy itself. The Nitralloy Corporation maintains a staff of metallurgists and engineers to assist present and prospective Nitralloy users at all times. To find how Nitrided Nitralloy can help put extra life and dependability into wearing, moving parts, write to THE NITRALLOY CORPORATION, 230 PARK AVE., NEW YORK 17, NEW YORK.**

659



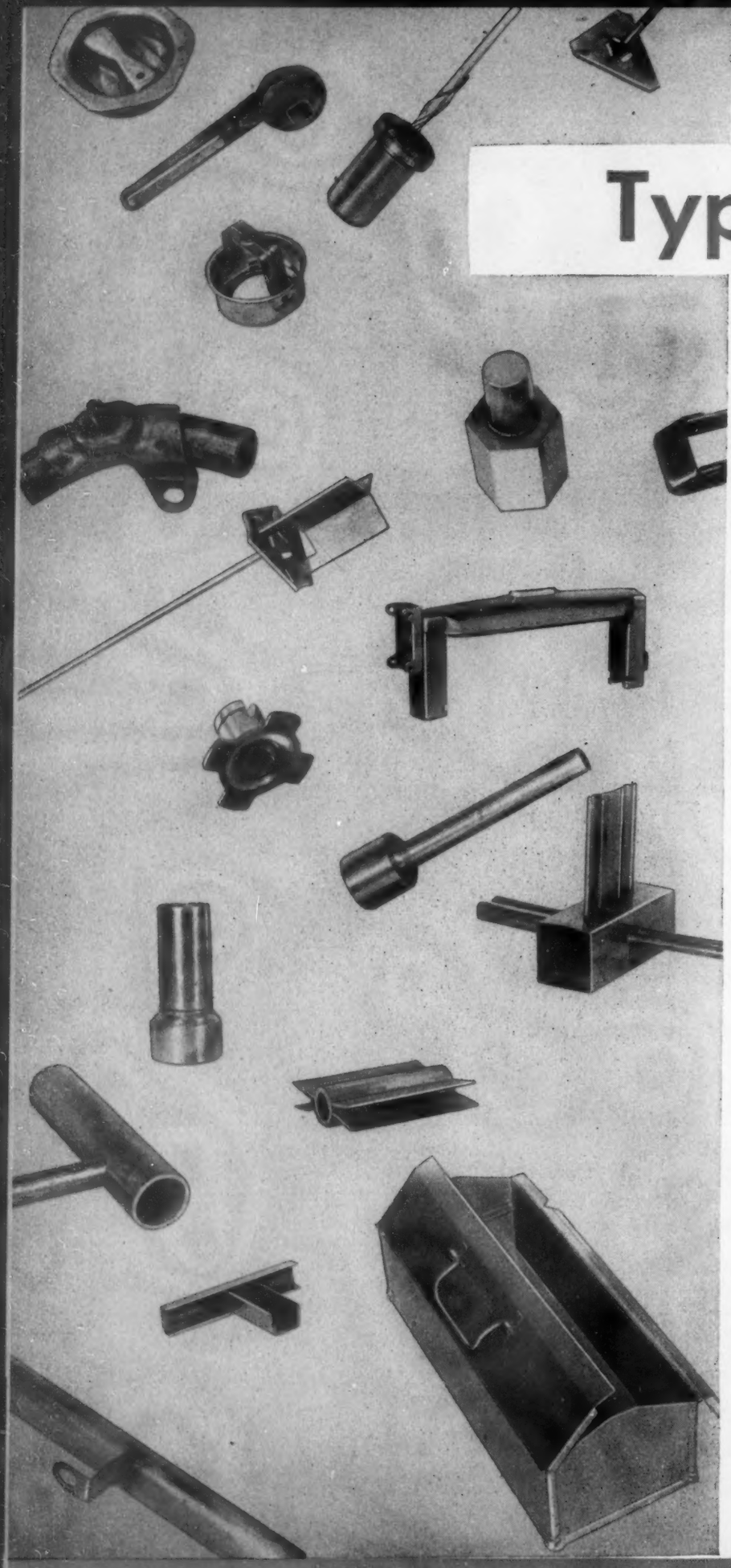
THE COMPANY WHICH IT KEEPS

Although introduced only a few years ago, today's list of National Cold Header users is a "Who's Who" of the bolt and rivet industry.

If you are not among those who are "cashing in" on it's wide possibilities, let us present you with the facts.

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO

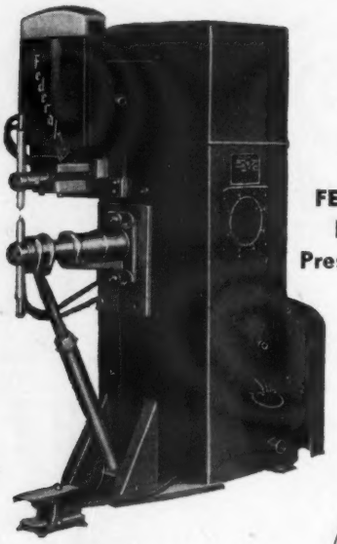
New York Detroit Chicago



You Could

Types of Produ

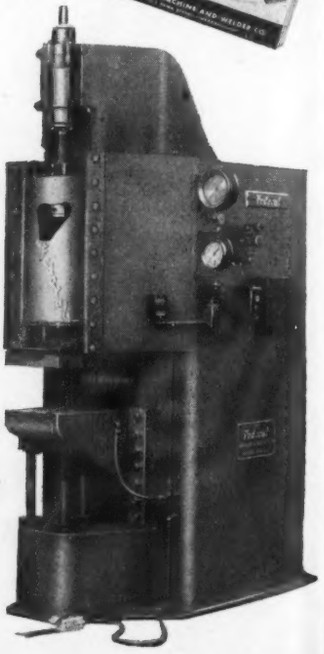
Federal



FEDERAL PH-1
HYDRAULIC
Press Type Welder

GET THIS BULLETIN

When you write for information, let us know the type of work in which you are particularly interested.

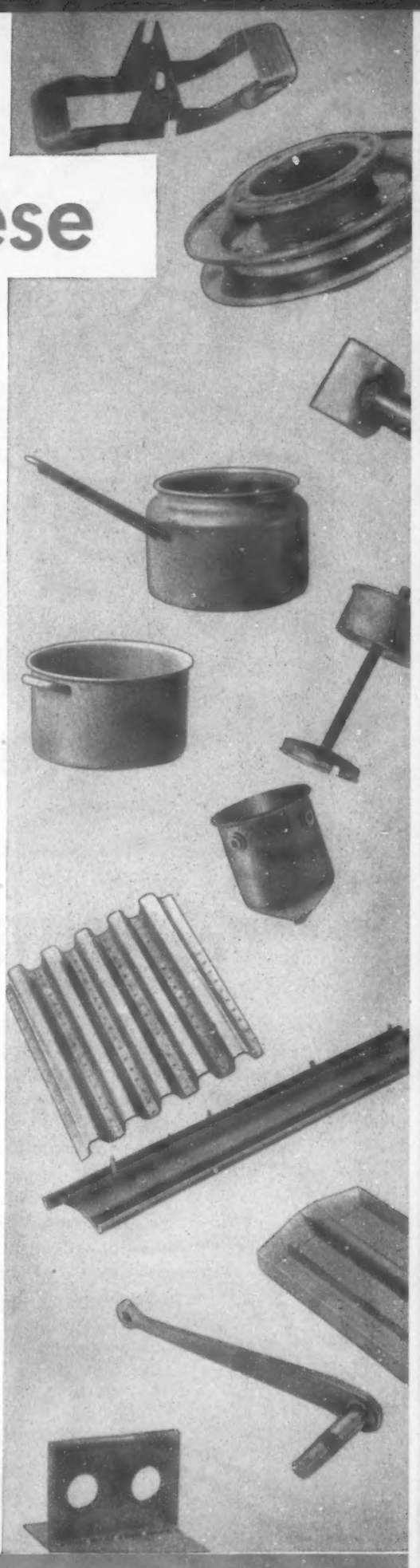


FEDERAL PH-4
HYDRAULIC
Press Type
Welder

Federal

MACHINE

Never List ALL Production Possible On These Press-Type Welders



It is no exaggeration to say that the versatility of Federal Press-Type automatic Resistance Welders can never be fully described.

Reason is that *new* corner-cutting, cost-saving applications are being developed every day in the year. What it boils down to is that if you have any metal fabrication in production quantities involving the permanent fastening of metal, it is important from the standpoint of quality, quantity and cost, that you apply to its production design all of the saving and speeding this type of welding can afford. Whether it be joining of delicate parts, such as in the radio tube illustrated at upper left, or heavy parts involving half-inch steel, like the bell-crank at lower right, or one of a million things in between, Federal Engineers can show you quickly and clearly how the Federal method fits your production.

Shown at left are the smallest (PH-1) and the largest (PH-4) standard models of the Federal Hydraulic Press Type Welders. PH-1 machines rate from 30 KVA to 75 KVA . . . PH-4's are standard up to 600 KVA. There are many sizes in between, many types to choose from . . . Air Operated, Motor Operated or combinations of Air and Toggle mechanism. They are adaptable to projection, spot or "percussion" welding or resistance brazing.

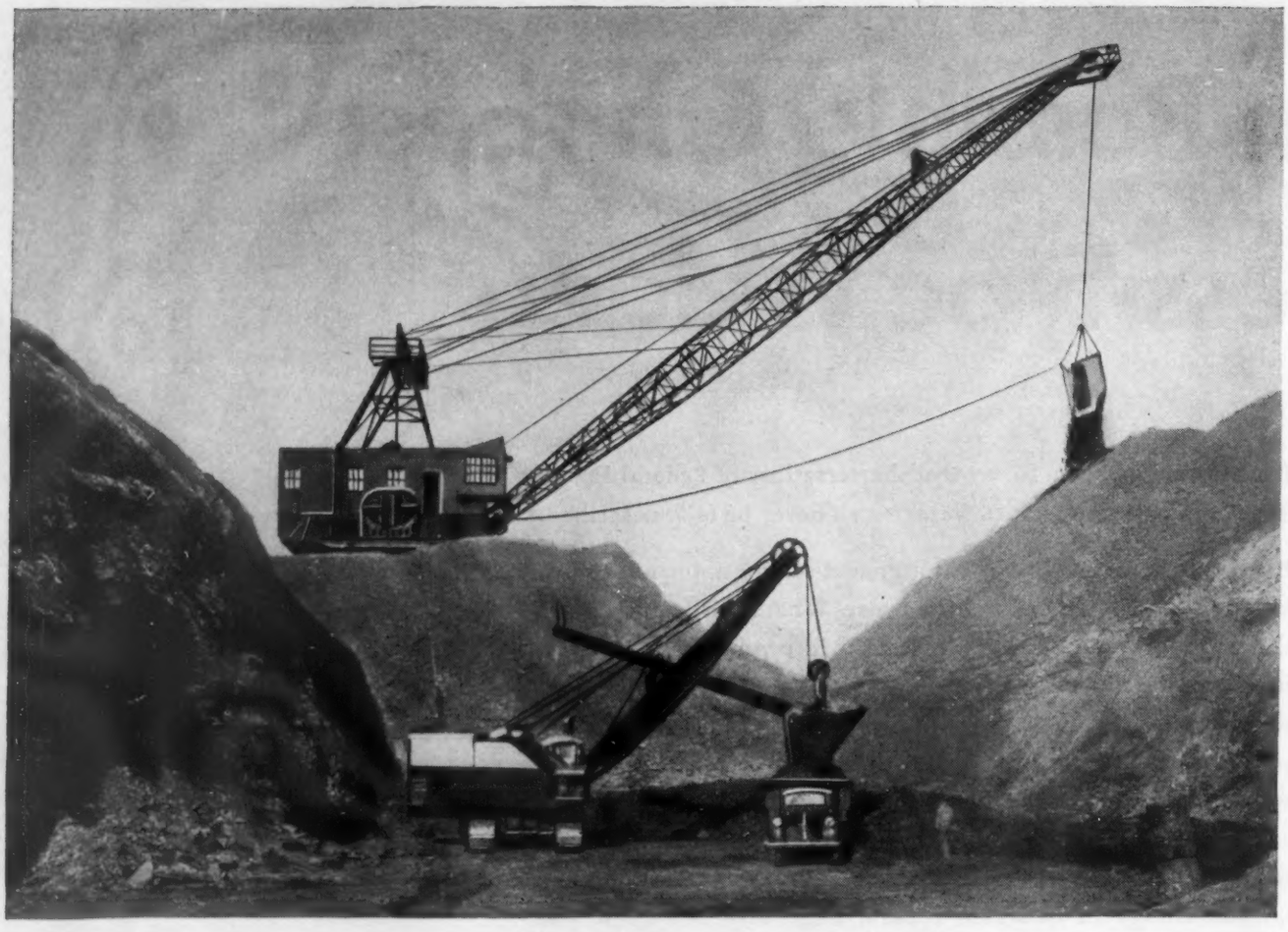
Write today for a Federal Press Type Welder Bulletin or arrange for a consultation on your own designs with a Federal engineer.

IN RESISTANCE WELDING THE NAME OF AUTHORITY IS

Federal

AND WELDER COMPANY

202 DANA STREET
WARREN, OHIO



One Of Wire Rope's Toughest Jobs!

THIS huge earth mover, known as a walking dragline, operating in a coal strip-mine, scoops up 6 tons of earth at every swing, each 50 to 60 seconds, day in and day out. Its efficiency---in fact, its ability to perform continuously month after month, year upon year---depends largely on a few strands of wire rope. ***This is one of the toughest jobs which wire rope is called upon to perform.***

Through these cables is transmitted all the power of a 400 horsepower Diesel engine, to swing a 160 foot steel boom and a truck size drag bucket. The wire from which this cable is made must be tough and strong---must resist abrasion---must be uniform in gauge and possess flexibility and other positive characteristics. These are the salient reasons why these cables are made from Youngstown's Yolectro High Carbon Rope Wire.

Like all its wire mill products, the wire supplied by Youngstown to wire rope manufacturers is of finest quality steel, refined, rolled and drawn to exact specifications. Youngstown wire can be furnished now to your specifications. Write, wire or phone our nearest branch.

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YOUNGSTOWN 1, OHIO

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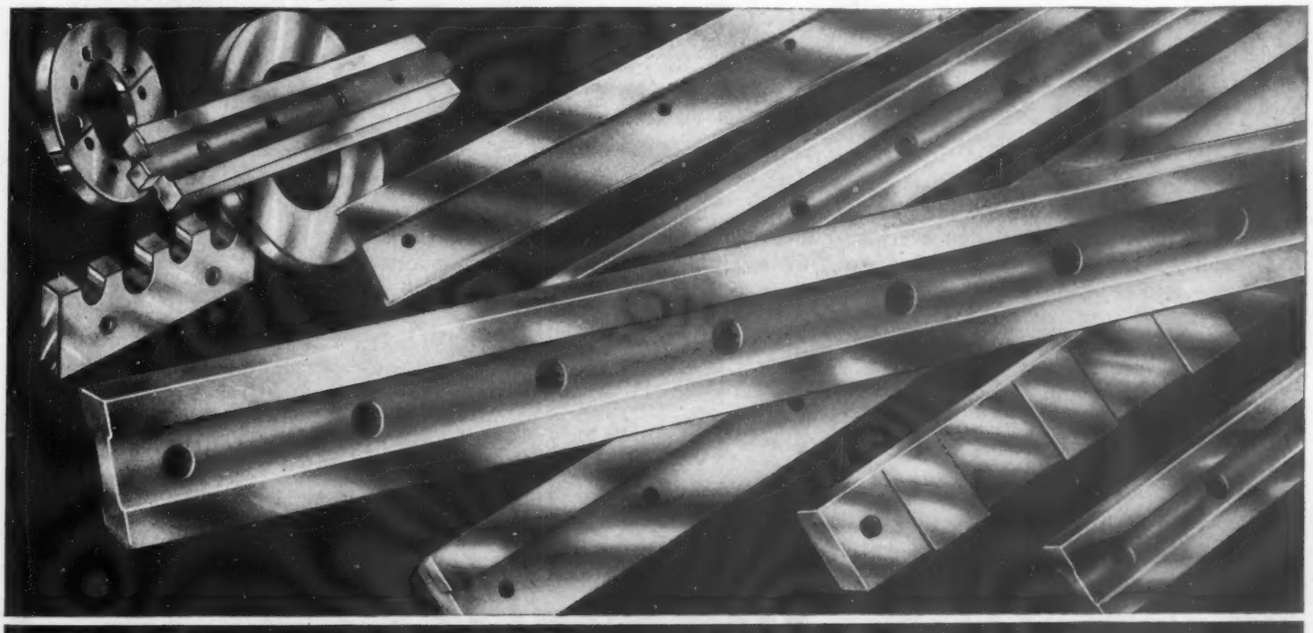
ENGINEERED FOR THE JOB

MORE THAN 50 YEARS of Service

THEY HOLD THE EDGE

because they are tempered and ground for your particular needs

Wapakoneta Shear Blades are made and heat treated, ***not*** to meet some universal standard of our own, but to best fill each customer's requirements... That is why Wapakoneta Shear Blades stand up longer on the job and cut more tonnage.



The Wapakoneta Machine Company

INCORPORATED 1891 — Wapakoneta, Ohio U.S.A.

Save a place

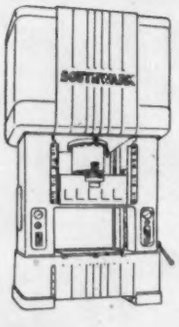
at your planning table

for a BALDWIN PRESS ENGINEER

If you've watched the trend in plant and shop equipment, you know that every year more and more presses have been finding their way into production lines.

Results that once used to require a dozen different shaping, machining and joining operations are now produced by a single thrust of a piston. In addition to economy, the product often gains in strength, appearance and utility because it is formed rather than assembled.

When you're thinking of tomorrow's



products... and tomorrow's competition... the profit and production possibilities of presses are too important to overlook. One of our engineers will be glad to review your manufacturing problem, and suggest the places where a Baldwin Press can help you produce better, faster and more economically in metal, plastics or rubber.

The Baldwin Locomotive Works, Baldwin Southwark Division, Philadelphia 42, Pa. Offices: Philadelphia, New York, Chicago, St. Louis, Boston, Washington, San Francisco, Cleveland, Detroit, Pittsburgh, Houston, Birmingham.

BLW THE BALDWIN GROUP

BALDWIN

SOUTHWARK

HYDRAULIC PRESSES

THERE IS ONLY ONE UPSON QUALITY

It's TOP quality—from full strong heads to clean sharp threads. For more than 90 years it has distinguished every item in Republic Upson's vast range of 20,000 headed and threaded products.

REPUBLIC STEEL CORPORATION
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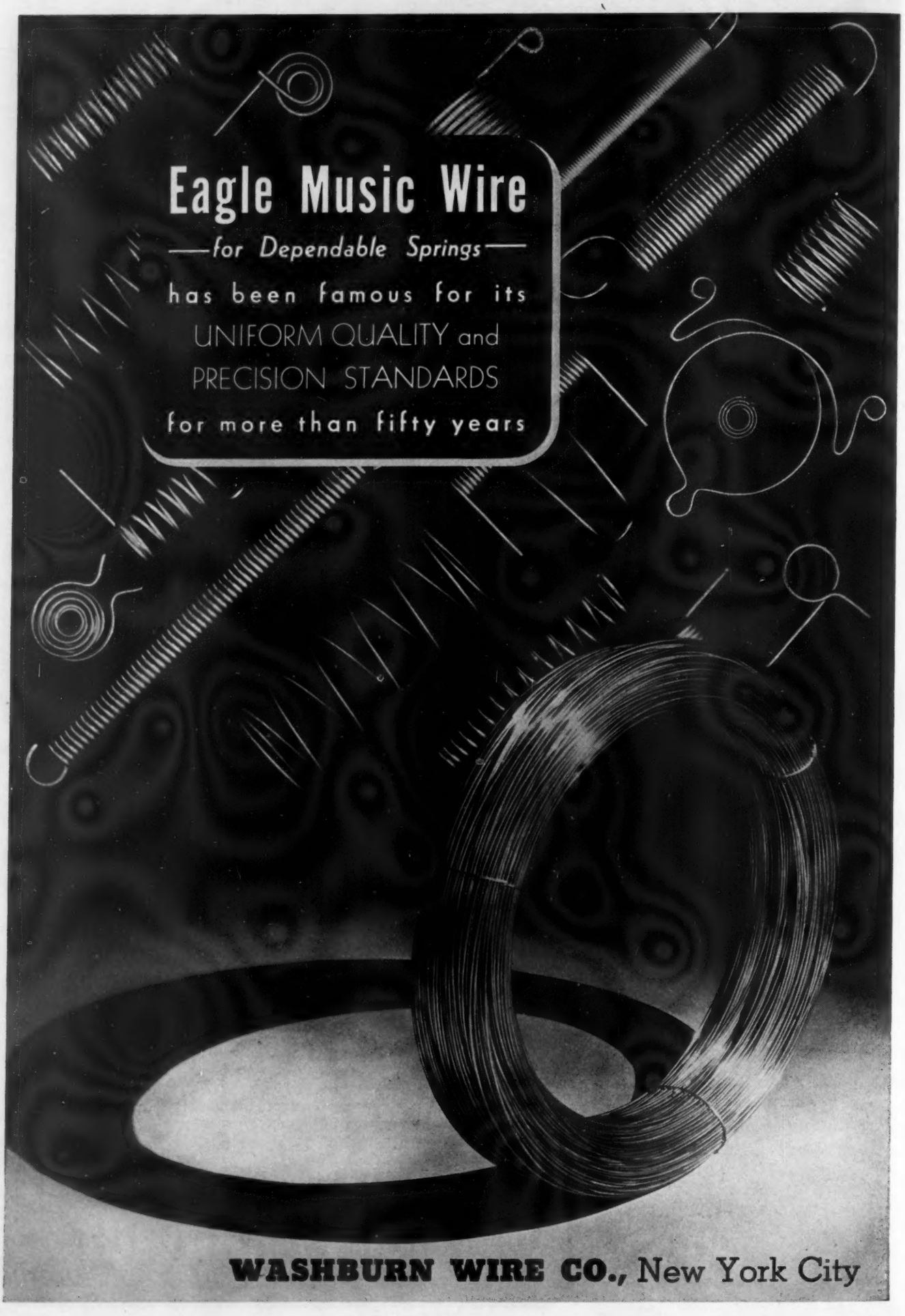
REPUBLIC *Upson Quality* BOLTS AND NUTS

Other Republic Products include Pipe, Sheets, Tubing, Hot Rolled and Cold Drawn Bars—Carbon, Alloy and Enduro Stainless Steels


Eagle Music Wire
—for Dependable Springs—
has been famous for its
UNIFORM QUALITY and
PRECISION STANDARDS
for more than fifty years
WASHBURN WIRE CO., New York City

you take the *HIGH* road and we'll take the *LOW* road

. . . and we'll get your product to market afore them

The stresses of war inevitably spur the development of new ideas, new methods, new processes, new operational procedures. The war just ended dramatically highlighted the advantages of allotting parts-production to outside sources; this production technique was responsible for much of Industry's success in meeting its urgent production schedules.

Why shouldn't the same production procedure be equally effective in the manufacture of peacetime products? The eager markets now awaiting your products—or your competitors' products if they can get there first—call for the adoption of every manufacturing shortcut. And "farming out" the production of your product parts not only assures faster output but leaves you free for the more important problems of assembly, distribution and sales.

Other advantages of this procedure not to be overlooked are lower capital investment, fewer labor problems and specialized workmanship.

The Joyce Machine Company offers you the practical benefits of its long specialization in the quantity production of machined metal parts . . . and the production of machined and welded assemblies. To our complete, modern equipment and long experience must be added the Joyce reputation for precision workmanship. No matter what your field of industry, Joyce is prepared to discuss the production of parts of any type, any quantity.

Why not let us sit down together and discuss the possibilities of this procedure as applied to your production problems? A discussion will place you under no obligation—and may disclose that your facilities backed up by ours can prove a winning team.

specializing in parts-production for peacetime products

JOYCE
Machine Company
HATBORO • PENNSYLVANIA
MANUFACTURERS OF PRECISION PARTS AND SPECIAL MACHINES FOR ALL KEY INDUSTRIES

The Secret of Good Pressmanship is to Put the Right Amount of Metal in the Right Place

At first glance, this alarm clock case has little to distinguish it from dozens of other cases we have made. However, the secret of successfully drawing this 6-oz. blank is in having extra amounts of metal available in the right place. And in correct quantity; too much would cause wrinkling—too little, spoilage . . . In stamping metal only .025" thick, we admit it is difficult to stretch and thin to any extent without cracking . . . Note in the first operation shown above how this extra metal has been placed in the blank to provide for the decorative legs and the rim prongs needed for the clock assembly . . . Stamped metal cases are thinner and lighter than plastics — will not warp or crack if dropped . . . Unquestionably, Presteel engineers can help you with some of *your* production problems.

WORCESTER PRESSED STEEL CO.

502 Barber Avenue Worcester 6, Mass.

ALLOY STEELS AND OTHER METALS COLD FASHIONED SINCE 1883

Representatives in Alexandria Virginia, Buffalo, Canton Ohio, Chicago, Denver, Detroit, Fort Worth, Indianapolis, Los Angeles, New York, Philadelphia, Syracuse, Toronto

Red Lead is
ALWAYS Pb_3O_4... *that's why*
it's a Dependable Metal Paint

Industry has yet to discover a better metal protective paint than Red Lead. This is due to inherent fundamental properties of the pigment itself.

Among the most important of these are Red Lead's definite chemical composition and its purity, as distinguished from pigments that have indefinite composition or vary from batch to batch, with resulting possibility of variation in performance.

The reason for this uniformity is that red lead is a simple chemical compound—a combination of only two elements, oxygen and high-purity metallic lead. It is also an extremely pure compound, containing no corrosion accelerating impurities such as water-soluble chlorides or sulfates.

Uniform performance means predictable chemical behavior—dependable performance as a rust-inhibitive paint, day after day, job after job.

Furthermore Red Lead has the property of controlling acid conditions recognized as accelerators of rust. In the presence of various acids, Red Lead forms insoluble lead salts, at the approximate rate at which the acids are supplied. This is true whether the acids originate from acid forming environments, such as gas, smoke, and moisture in the atmosphere, or from the oxidation of the paint vehicle.

Remember, too, that Red Lead is compatible with practically all vehicles commonly used in metal protective paints, including all the fast drying resins.

Specify RED LEAD
for All Metal Protective Paints

The value of Red Lead as a rust preventive is most fully realized in a paint where it is the only pigment used. However, its rust-resistant properties are so pronounced that it also improves any multiple pigment paint. No matter what price you pay, you'll get a better paint for surface protection of metal if it contains Red Lead.

***These spectograms** show the high degree of uniformity and purity of nine different batches of Red Lead. Each spectrum is a practical duplicate of every other. Such uniformity is an important reason for Red Lead's outstanding performance.*

* * *

Write for New Booklet — *"Red Lead in Corrosion Resistant Paints"* is an up-to-date, authoritative guide for those responsible for specifying and formulating paint for structural iron and steel. It describes in detail the scientific reasons why Red Lead gives superior protection. It also includes typical specification formulas. If you haven't received your copy, address nearest branch listed below.

* * *

The benefit of our extensive experience with metal protective paints for both underwater and atmospheric use is available through our technical staff.

NATIONAL LEAD COMPANY: New York 6, Buffalo 3, Chicago 80, Cincinnati 3, Cleveland 13, St. Louis 1, San Francisco 10, Boston 6 (National Lead Co. of Mass.); Philadelphia 7 (John T. Lewis & Bros. Co.); Pittsburgh 30 (National Lead Co. of Pa.); Charleston 25, W. Va. (Evans Lead Division).

Dutch Boy
Red Lead

Let's Look at SALEM'S RECORD on Continuous Buttweld Pipe Mills

Efficient metal recuperators . . . another "S" contribution to high operating efficiency and lower maintenance costs.

When you invest your company dollars in a major expenditure like Continuous Buttweld Pipe Mills, you want the benefit of men who know *all* the answers.

Salem knows the pipe business from all angles . . . equipment, manufacturing, and markets.
We should.

Salem has engineered, built, or furnished equipment for every continuous buttweld pipe mill installed in the United States and Canada.
Experience on the following installations comprising all of the continuous buttweld pipe mills in U. S. and Canada is available when you Call Salem.

Etna, Pa. . . Two furnaces by Salem.
Welland, Ont. . . Complete installation by Salem.
Youngstown, O. Complete installation by Salem.
Youngstown, O. . . Furnace by Salem.
Youngstown, O. . . Furnace by Salem.
Sparrows Pt. Two complete installations by Salem.
Indian Harbor . . Complete equipment by Salem.
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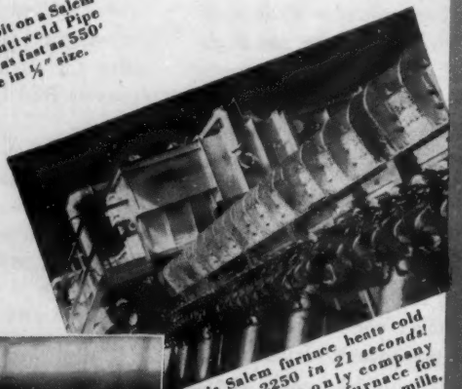
These mills produce 1,000,000 tons of quality pipe per year.

Operator's pulpit on a Salem Continuous Buttweld Pipe Mill . . speeds as fast as 550' per minute in ⅛" size.



This Salem furnace heats cold skelp to 2250 in 21 seconds! Salem is the only company which has built a furnace for continuous buttweld pipe mills.

The original single loop has been improved by a double loop. Saves space and improves operating efficiency. The patented Salem double loop eliminates time-consuming difficulties.

SALEM

SALEM ENGINEERING CO. SALEM OHIO

"Engineered Mills" TORONTO, ONTARIO, CANADA • LONDON, ENGLAND

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HELP YOU TO KEEP WELDING COSTS

• Type and cost of current used—welding position—fit-up—efficiency of the operator—all these affect the over-all cost of production welding. Quite as important as any of these are the type, size and make of electrode used. And that's where PAGE comes in. Here's why.

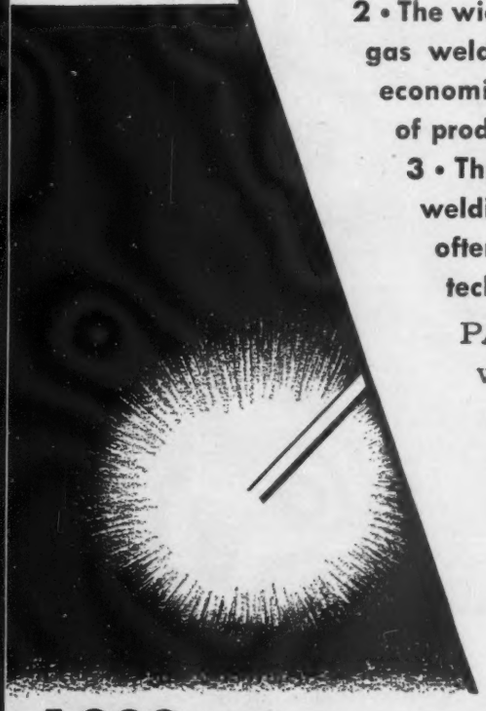
1 • PAGE electrodes are of uniformly high quality. Experienced welders take that for granted.

2 • The wide range of PAGE electrodes and gas welding rods includes the one most economical rod for practically every type of production welding.

3 • Through long and close contact with welding engineers and welders, PAGE is often able to help on problems of welding technique and the selection of rods.

PAGE specializes in stainless steel. But whatever your problem, if it has to do with welding, it will pay you to . . .

Get in touch with Page!

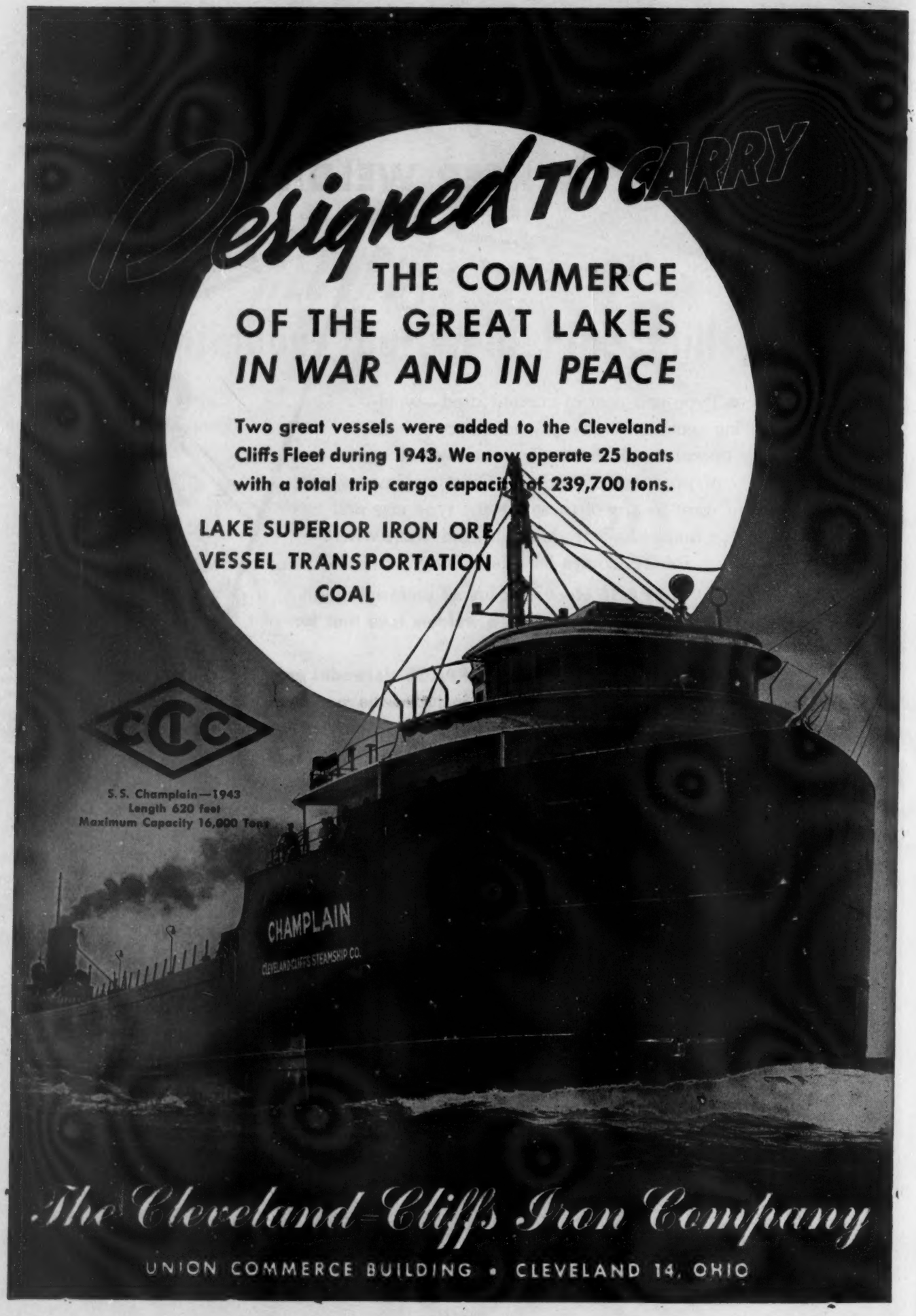


ACCO

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Pittsburgh, Portland, San Francisco, Bridgeport, Conn.

ACCO TRADE MARK

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE


Designed TO CARRY
THE COMMERCE
OF THE GREAT LAKES
IN WAR AND IN PEACE
Two great vessels were added to the Cleveland-Cliffs Fleet during 1943. We now operate 25 boats with a total trip cargo capacity of 239,700 tons.
LAKE SUPERIOR IRON ORE
VESSEL TRANSPORTATION
COAL
CCC
S. S. Champlain—1943
Length 620 feet
Maximum Capacity 16,000 Tons
CHAMPLAIN
CLEVELAND-CLIFFS STEAMSHIP CO.
The Cleveland-Cliffs Iron Company
UNION COMMERCE BUILDING • CLEVELAND 14, OHIO

. . . eenie meenie minie mo . . .

When you buy Simonds* Grinding Wheels, you avoid the unnecessary risk of chance selection. From thousands of combinations of grain, grade, structure and bond, you can narrow down selection to wheels adapted to your job and to your equipment for maximum economy of operation, including low wheel cost. Whether you are dealing in roughing dimensions or the micro-inches of finishing, there is a Simonds Borolon (aluminum oxide) or Simonds Electrolon (silicon carbide) wheel to reveal new grinding efficiency for you.

Through Simonds Abrasive Company distributors over a half century grinding wheel experience provides abrasive products and service backed by engineering and ceramic skill proved by continuous experiment, test and inspection.

The Simonds Abrasive Company 120 page Data Book is good guidance for specification of Grinding Wheels; Segments; Mounted Wheels and Points; Grains, Bricks and Sticks. A copy is available on request.

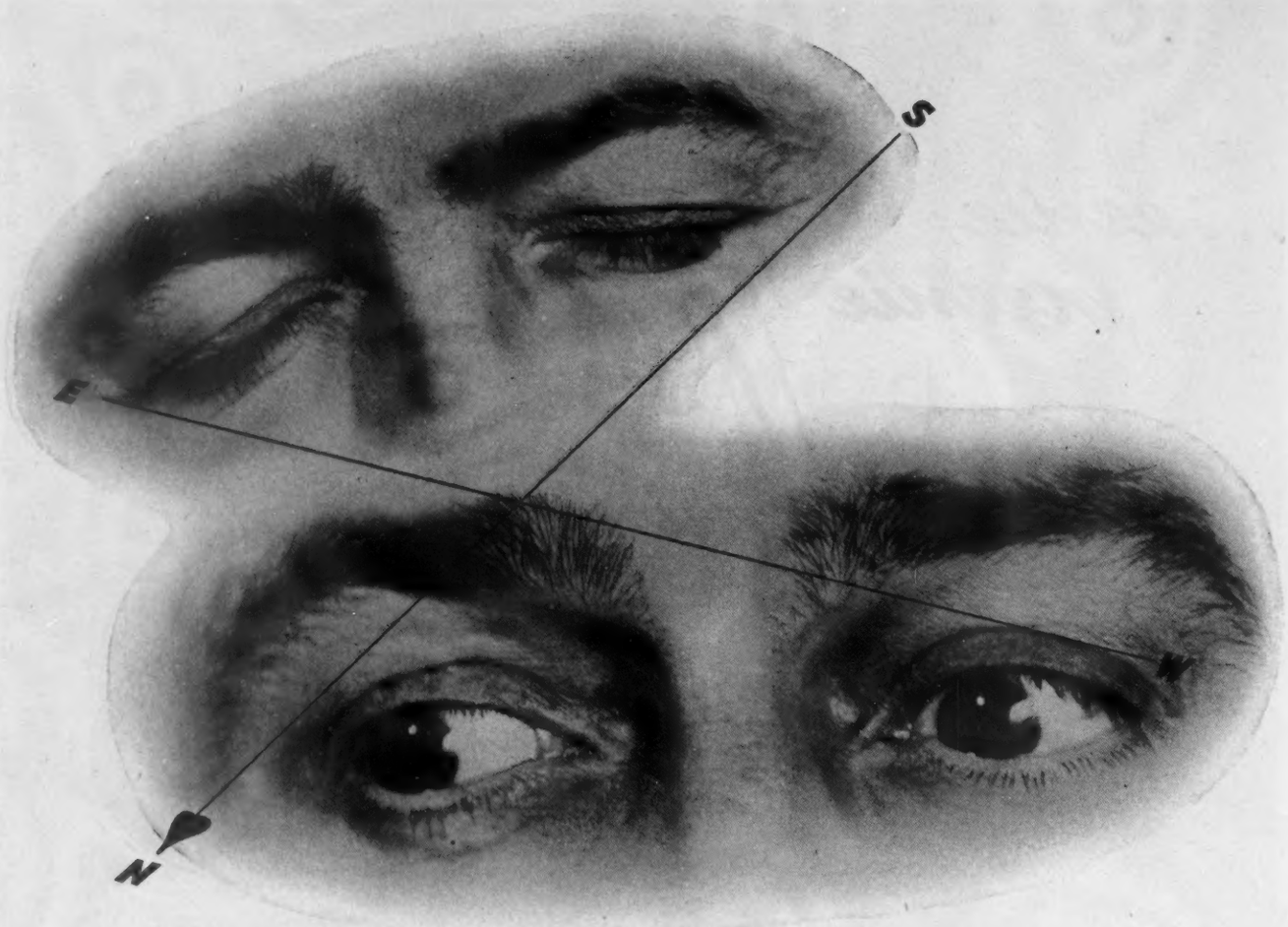
**** Time-honored Borolon and Electrolon Abrasive Products are now distinguished by the name Simonds.***

SIMONDS ABRASIVE CO. ***is a Division of***
SIMONDS SAW & STEEL CO.

Other affiliated companies are Simonds Steel Mills and Simonds Canada Saw Co., Ltd.

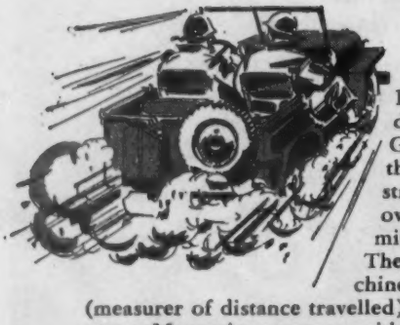
SIMONDS ABRASIVE CO.

SIMONDS ABRASIVE COMPANY · PHILADELPHIA 37, PA. · DISTRIBUTORS IN ALL PRINCIPAL CITIES



HOW TO MAKE A MAP

with 4 "Mathematical Eyes" and a Jeep!



Do it the way Yank jeeps did it in Italy, France and Germany, when they used this equipment to navigate straight to enemy objectives over night-hidden or unfamiliar highways and terrain. They used this uncanny machine called an "odograph" (measurer of distance travelled), which consists of three parts: Magnetic compass with electronic follower . . . plotting unit with map table, tracing pencil, and Veeder-Root Mileage Counters . . . and a power pack operating from storage batteries. This odograph can plot maps from any scale of 1:200,000 to 1:500,000.

Actuated by a beam of light projected into the compass bowl and reflected from a mirror at the center of the compass card, the Veeder-Root mileage counters indicate the distance travelled east and west or north and south of a given starting point. And when two of these "Mathematical Eyes" are counting the miles travelled, say, northeast . . . then the other two eyes are electronically shut and do not count at all. Yet a total is registered of miles travelled in *any* direction. So a set course can be checked . . . or an unmapped course can be mapped . . . by this eerie equipment which needs no information beyond its original bearing, and which can see through walls of steel and dark of night. It always provides an accurate spot-location in land miles, in any direction, from the given starting point. *The map is plotted as you ride!* There are other features which had the Huns talking to themselves. And the peacetime uses you can figure for yourself!

All that remains to be said here is that this is another of the unlimited and unpredictable uses to which men of imagination can put Veeder-Root Counting Devices. These devices can be applied, in ways just as unheard-of as this, to hosts of products now in use or still on the drafting boards. For Veeder-Root Devices can be built-in as integral parts of any product . . . to provide continuous *Count*rol over performance or production . . . or to provide proof of performance-guarantee. So take *Count*sel now with Veeder-Root engineers, and let them open *your* "Mathematical Eyes" to new possibilities for *your* product.

The Counting House of Industry

VEEDER-ROOT INC.

HARTFORD 2, CONNECTICUT

In Canada: Veeder-Root of Canada, Ltd., Montreal
In England: Veeder-Root Ltd. (New address on request)

WEIRTON HIGH-CARBON STRIP

cold-rolled spring steel

TAKES A COLD FORM WITH EASE

Here is a high-carbon steel that you can cold-form with greater ease, and can heat-treat accurately after forming, to secure the range of hardness or the springiness desired.

Weirton high-carbon strip cold-rolled spring steel is supplied spheroidize-annealed . . . ductile for easy forming or blanking. It has accurate response to heat-treatment, exceptional uniformity of gauge and width, rigidly controlled chemical and physical properties, exact constancy of grain structure, and controlled decarburization limits. Where high fatigue resistance or springiness is needed, Weirton high-carbon strip opens wide the door to better products and more economical manufacturing.

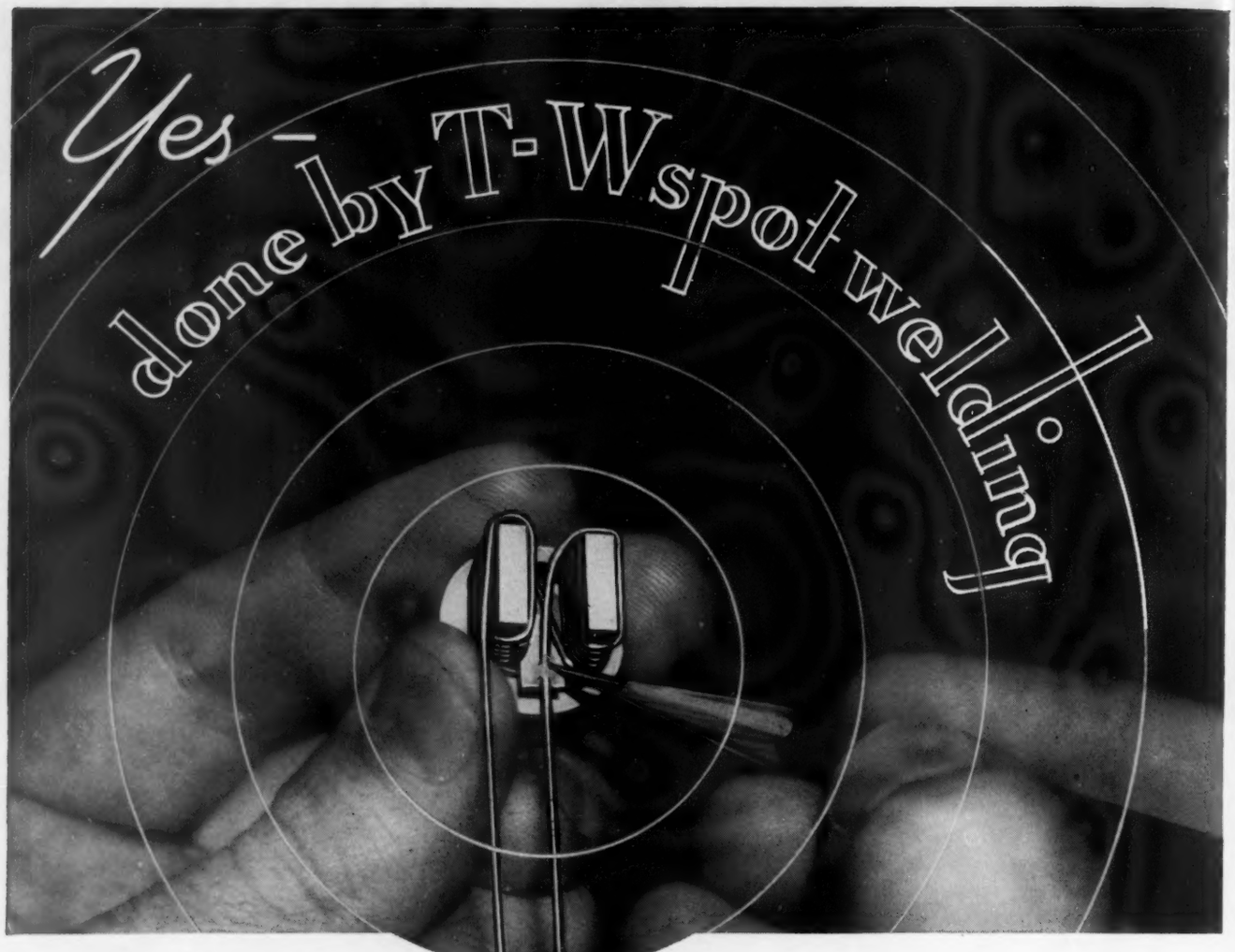
Supplied with the desired chemical analysis, and for specified heat-treating and hardness ranges in strips up to 7 inches wide.

WEIRTON STEEL CO.

WEIRTON STEEL COMPANY

WEIRTON, W. VA. *Sales Offices in Principal Cities*

Division of **NATIONAL STEEL CORPORATION** *Executive Offices, Pittsburgh, Pa.*



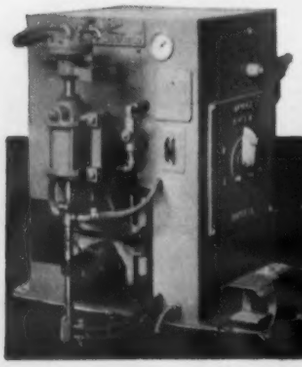
Pin Size Copper brass plate on a wire attached to ½" x 3/16" Taylor-Winfield spot welder

You can do amazing things with resistance welding machines.

The usual method for attaching this wire to the minute brass plate would be soldering. But too many fumbling thumbs cause too many rejects. Equally important, corrosion troubles are eliminated because resistance welding does not require the use of flux.

Taylor-Winfield equipped a Spot Welder with special dies to expedite handling of the odd-shaped parts. Result, continuous production with practically no rejects on this electrical part.

Resistance welding has put the joining of metals on a production basis. Try it and watch those production costs go down. *Write Taylor-Winfield for profitable information on spot, seam, flash-butt, or projection, all forms of resistance welding.*



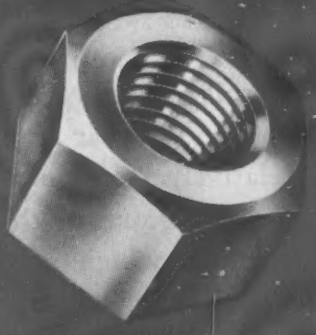
Combining streamlined appearance with sound engineering practice, Taylor-Winfield spot welders are used for the welding of clean and coated carbon steels, stainless steels and weldable alloys of aluminum, nickel, copper and magnesium.

The TAYLOR-WINFIELD CORPORATION
WARREN · OHIO

MILTON *Engineered** BOLTS AND NUTS

hold fast!

MILTON BOLTS
½" and Larger. Alloy and Carbon Steel. Galvanized and Electroplated.
MILTON NUTS
½" to 8" Bolt Diameter. Case-hardened and Heat-treated.



BOLTS
NUTS
BARS
ANGLES
CHANNEL

UNDER toughest conditions—maximum stress, constant vibration, sudden strain—you can rely on the strength and stamina of large Milton bolts and nuts. They won't flinch because they're accurately made of special analysis steel —*hot forged* to preserve the molecular structure.

Close tolerances, precise fits, proper threading, freedom from structural flaws—all are assured by careful manufacture, rigid inspection . . . and by Milton's sixty years of experience.

Milton bolts and nuts are long-time standbys in the metal-working industries, shipbuilding, refineries, railroads and construction. *They are premium products at no premium price.*

Call the Milton man in your area. Tell him your needs. He'll be glad to show you the advantages of Milton bolts and nuts for your requirements.

THE MILTON MANUFACTURING COMPANY

MILTON, PA. • 1886-1946

SALES OFFICES

BOSTON • CHICAGO • NEW YORK • PHILADELPHIA • PITTSBURGH • READING

****Engineered* to withstand unexpected shocks and strains**

✓ check with

Follansbee

on COLD ROLLED STRIP

In spite of crowded mill schedules, Follansbee may be able to fill your requirements for Cold Rolled Strip in relatively short time. Follansbee service is well-known to its customers—the ability to make adjustments in schedules which is characteristic of this compact, highly skilled organization.

Follansbee will handle your inquiries promptly . . . take care of your orders with rigid adherence to accepted specifications and shipping schedules. Check with any Follansbee Office or Sales Agency on your requirements for Cold Rolled Strip or other steels.

FOLLANSBEE STEEL CORPORATION

GENERAL OFFICES • PITTSBURGH 30, PA.

Sales Offices—New York, Philadelphia, Rochester, Cleveland, Detroit, Milwaukee. *Sales Agents*—Chicago, Indianapolis, Houston, St. Louis, Kansas City, Nashville, Los Angeles, San Francisco, Seattle; Toronto & Montreal, Can. *Plants*—Follansbee, W. Va. and Toronto, O.

COLD ROLLED STRIP

ELECTRICAL SHEETS AND STRIP

CLAD METALS

POLISHED BLUE SHEETS

SEAMLESS TERNE ROLL ROOFING

Tube Mill Machinery

By TAYLOR-WILSON MFG. CO.

Builders of

Fretz-Moon Tube Mills

Tube Mill operators from coast to coast are turning to Taylor-Wilson Machines to offset increasing costs.

Yes, Taylor-Wilson machines are part of a nation-wide trend toward greater efficiency and high production per machine.

WE MANUFACTURE

Straightening, Burnishing and Sizing Machines
Galvanizing Equipment for Pipe
Small Seamless Tube Mills,
Butt Weld Pipe Mills,
Tube Cutting-off Machines,
Tube Testing Machines,
Complete line of Equipment for finishing of pipe.

Taylor-Wilson Mfg. Co.

Thomson Ave. McKees Rocks, PA. (Pittsburgh District)

Affiliated with Arms-Franklin Corp.

Engineers and Builders of Rolling Mill Machinery

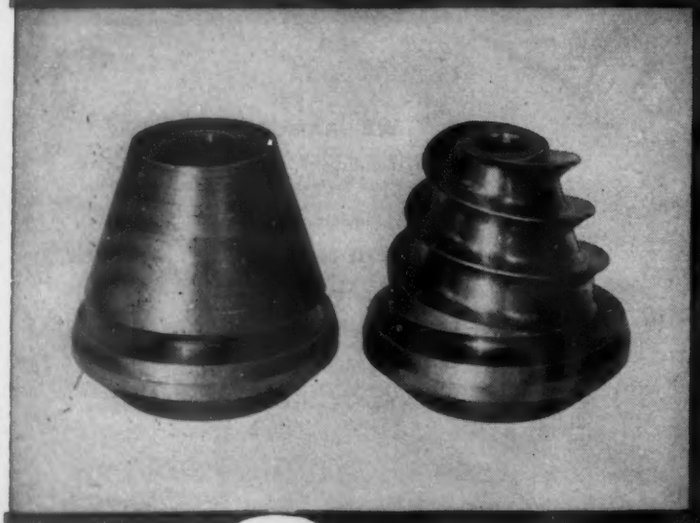
How to make Profits TODAY

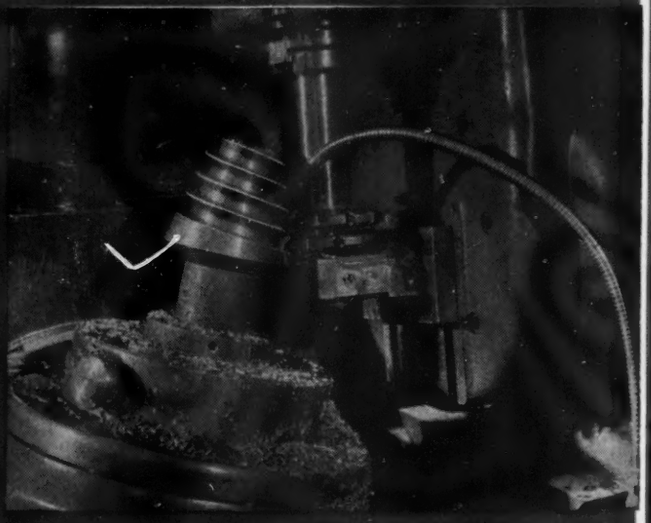
AUTOMATIC PROCESSING IS THE ANSWER

Here's an example: This Cross Special Machine with one unskilled attendant produces the equivalent of 10 individually operated machines of conventional design. It reduces the piece cost of machining Oil Drill Cutters from $.95 to $.50. It returns a first year profit of 117% and 51% on the original investment during each subsequent year of use.

One of 29 different types of Oil Drill Cutters milled on this machine.

One of the six identical, self-contained thread-milling units, operating in automatic cycle.





CROSS

New York • Chicago • DETROIT • Cleveland • Cincinnati

Here's how it works: The bed rotates continuously. During one revolution, each of six independent, self-contained stations mills the taper threads on one piece of work—six pieces are completed in a revolution. As each station passes the operator, he simply unloads, reloads, and starts the automatic cycle by pushing a button. Production is 40 Oil Drill Cutters per hour at 80% efficiency.

Send for the booklet that tells about other Cross case histories that increased profits by lowering costs. Write The Cross Company, Detroit 7, Michigan, Dept. 194.

S-27

SPECIAL MACHINES

for automatically performing any one or a combination of metal cutting operations
TURNING · MILLING · DRILLING · BORING · REAMING · TAPPING · GRINDING

1946

...and a good time to meet the entire family of

LATROBE

tool and die steels

HIGH SPEED STEELS	Electrite No. 1 Electrite No. 19 Electrite Vanadium Electrite Double Six M-2 Electrite Tatmo Electrite Cobalt Electrite Super-Cobalt Electrite Ultra Cobalt Electrite HV-6 Electrite CO-6	SHOCK RESISTING STEELS	XL Staminal Lanark Gordon
		PLASTIC DIE STEELS	LC Iron LCX Iron Select B
		CARBON TOOL STEELS	Special Extra Standard
HOT WORK STEELS	EHW NO. 1 CHW CLW LPD MGR	SPECIALTY STAINLESS	TYPES 302 410 303 416 304 420 403 430
DIE STEELS	Mangano Mangano Special GSN GSN Special Select B Cobalt Chrome Carbon Cold Header	RED ARROW CAST ALLOY	for cutting tools for dies and die inserts for hard facing welding rods: (No. 48, No. 58, No. 64)
DIE CASTING DIE STEELS	Dycast No. 1 Lumdie ZTM VDC		

Technical information is available on any of these steels. Write

Latrobe ELECTRIC STEEL COMPANY

MAIN OFFICES *and* PLANT · · LATROBE · PENNSYLVANIA

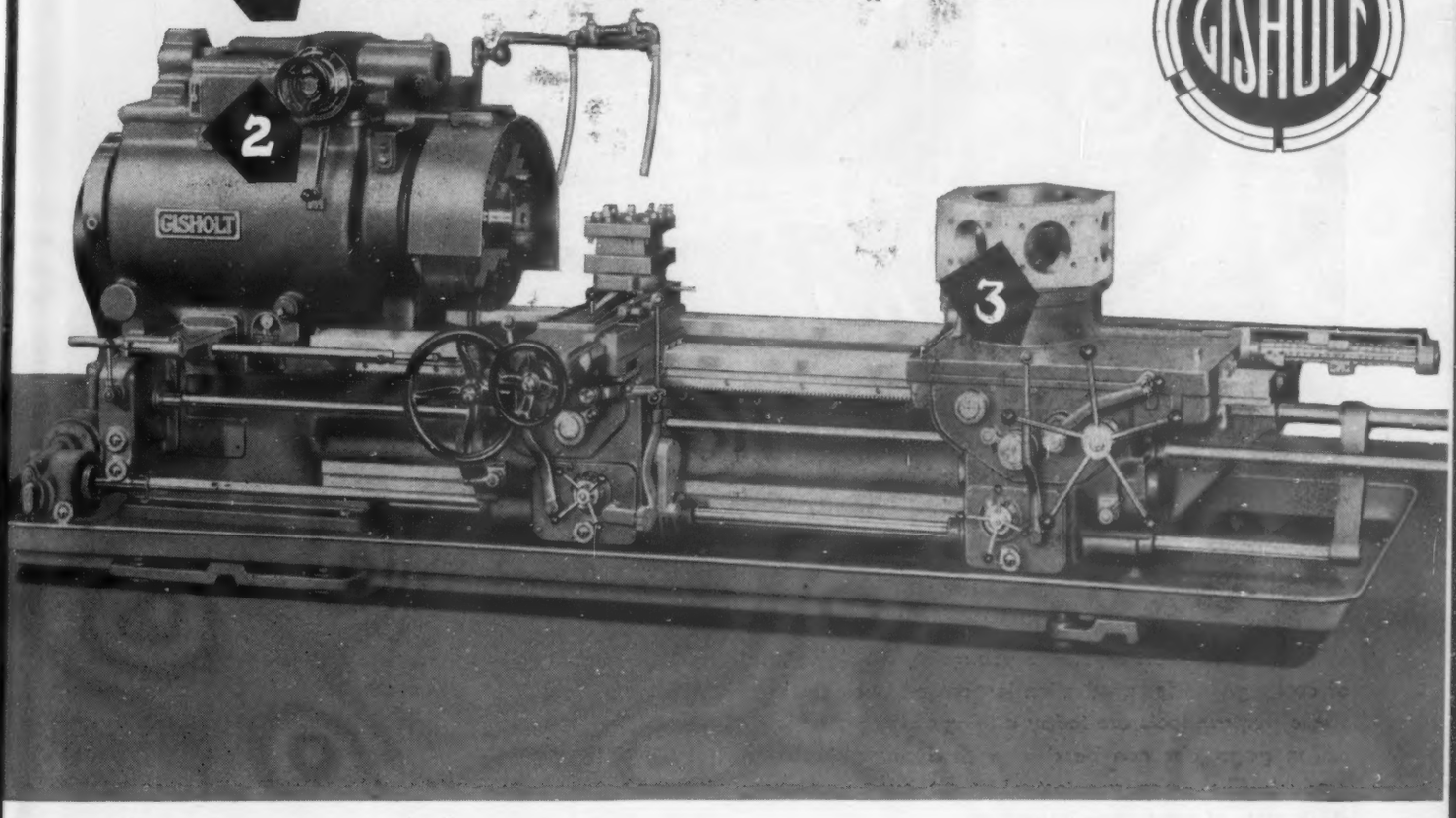
3 ways to increase production

Actual cutting time on a turret lathe is usually determined by using the maximum speeds and feeds the cutting tools will withstand. Isn't it true, therefore, that the greatest opportunity for time-saving is in cutting the lag between cuts?

By substituting automatic operation for certain manual motions, Gisholt Turret Lathes have made it possible to increase the percentage of actual cutting time in relation to the complete cycle. This means increased production—lower machining costs.

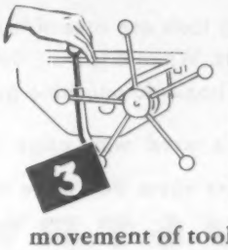
GISHOLT

The machine illustrated below is a Gisholt 4L Saddle Type Turret Lathe.



Spindle speed changes can be made instantly without stopping the spindle or releasing the main drive clutch. The Gisholt Hydraulic Speed Selector, power operated, eliminates manual gear shifting. It may be operated either direct or pre-set.

Hydraulic spindle control provides for starting, stopping or reversing by a mere touch of this handy lever. When in neutral position, braking is automatic, bringing the spindle to a quick, smooth stop. Headstock control is as easy as pressing buttons.



Power rapid traverse for both hexagon and square turrets insures quicker movement of tools in and out of cutting position. With transverse travel of the cross slide, time savings are substantial on many jobs. Operating effort is reduced to a minimum.

LOOK AHEAD...KEEP AHEAD...WITH GISHOLT

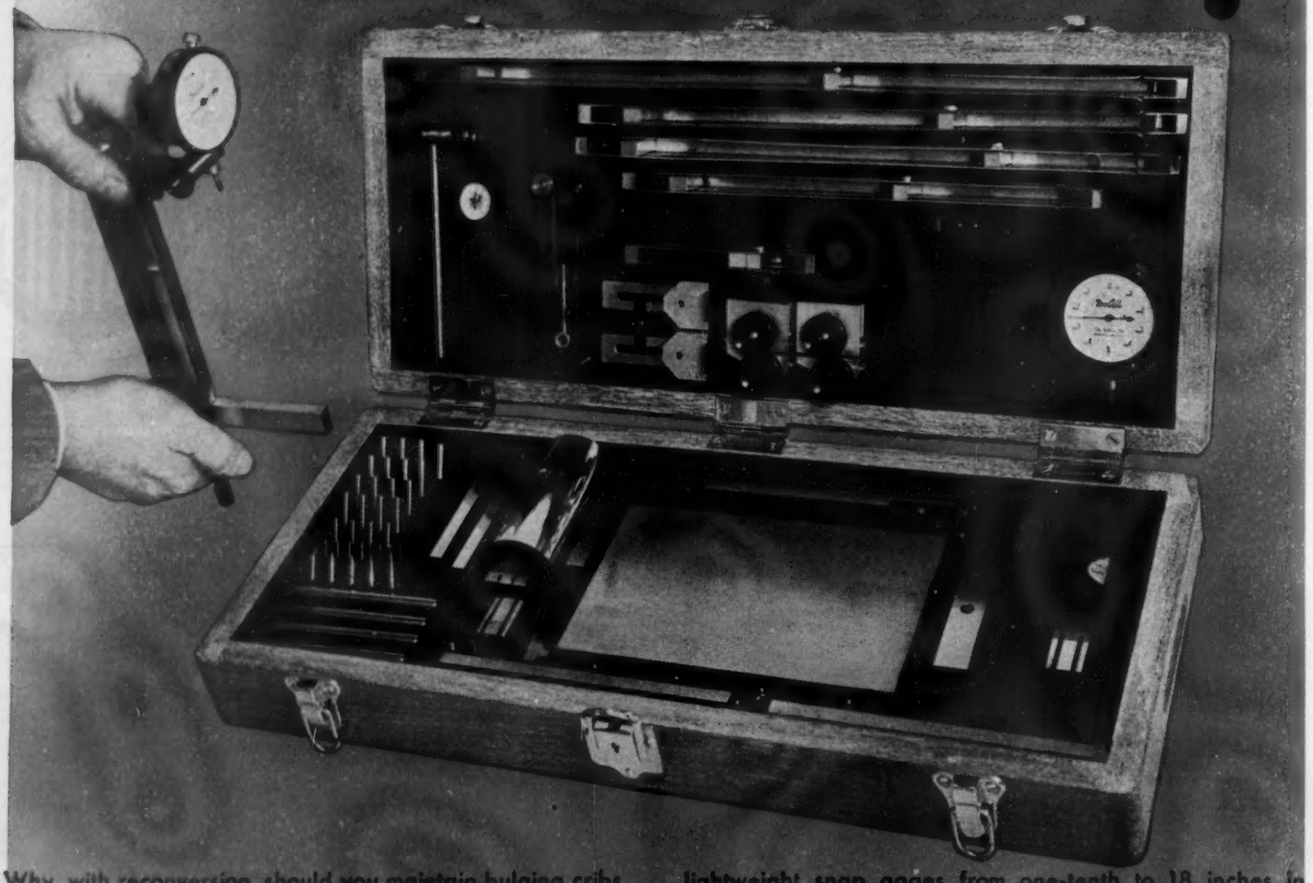
GISHOLT MACHINE COMPANY

1217 E. Washington Avenue • Madison 3, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

A Million Precision Gages with DoALL'S "PRODUCTO-CHEK"!

PATENTS PENDING



Why, with reconversion, should you maintain bulging cribs of costly gages for production inspection? Such stocks of single-purpose tools are today a thing of the past. Now a million gage jobs can be done with a small kit—DoALL Producto-Chek—the greatest short-cut ever devised to slash costs of production inspection.

Accurate gaging tools are assembled from Producto-Chek in a few moments. When a job is finished, parts are simply replaced in the box—no unusable gages left to write off.

Producto-Chek is used with gage blocks. It gives you lightweight snap gages from one-tenth to 18 inches in size; plug gages of all sizes in steps of .0001 inches; angle and multiple comparators; square checks; bench comparators; internal and external calipers; height gages; pitch and center gages and many other instruments.

Besides providing limitless types, sizes and combinations of gages, Producto-Chek makes gaging operations visual and dependable. Dial indicators show if measurements are "on the head" or "off" and exactly how much—no guesswork in squinting for square check, nor dependence on the "feel" of snap gages.

We want to show you more about Producto-Chek—Why not phone or write for Producto-Chek Circular?

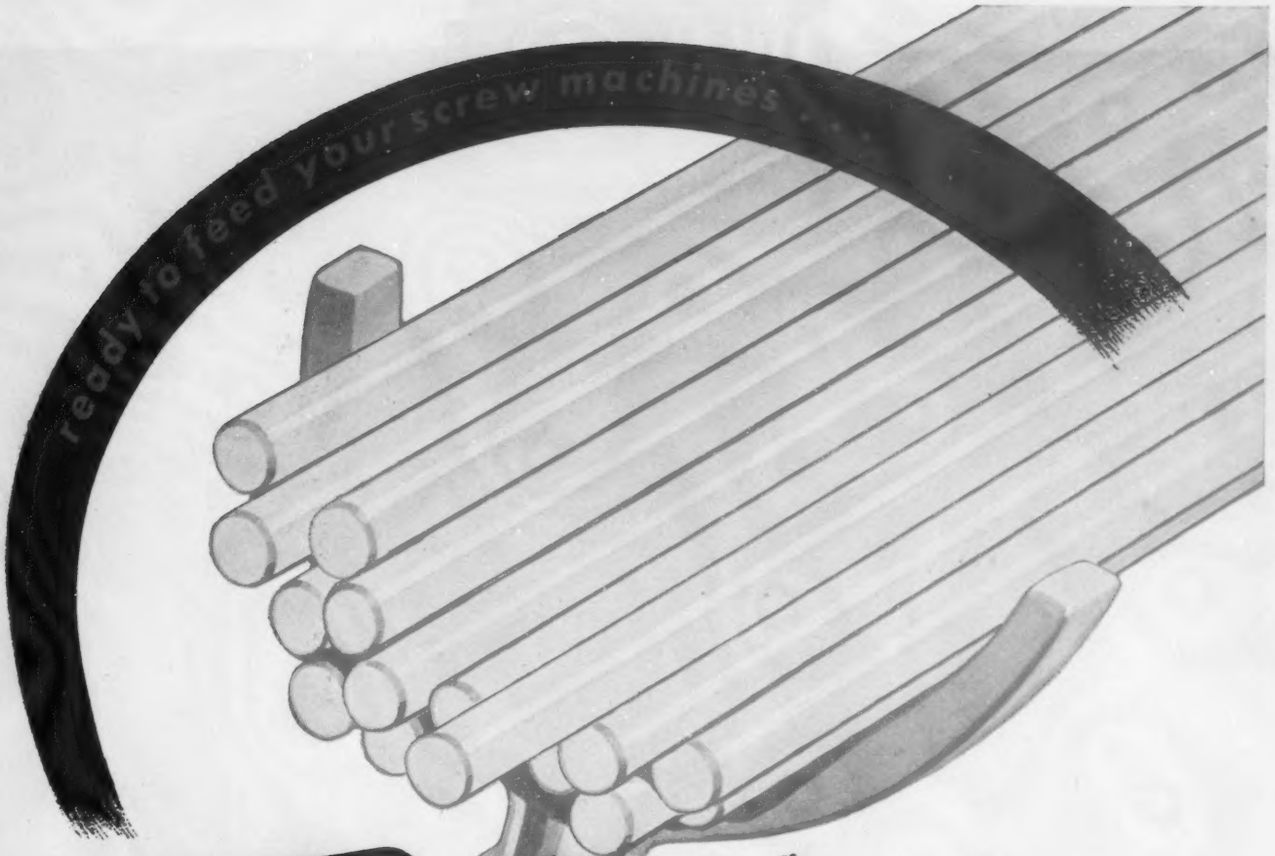
INDUSTRY'S NEW SET OF TOOLS

Contour Sawing | Band Filer | Surface Grinders | Magnetic Chucks and Selectron | Colloidal Oils | Dust Collector | SPEEDMASTER | Band Saws | Band Files | Gage Blocks with Instruments

Baltimore	SA 5778	Denver	KE 7511									Pittsburgh	AT 3386	San Francisco	GA 4784
Birmingham	3-0502	Detroit	TE 2-3060									Providence	WI 1515	Seattle	EAST 7500
Boston	ASP 6669	El Paso	MAIN 7846									Reading	7258	Statesville	518
Buffalo	PA 6666	Grand Rapids	8-0922									Rochester	MAIN 5175	Syracuse	3-7212
Chicago	SEE 1166	Hartford	5-6664									Rockford	MAIN 227	Toledo	GA 8309
Cincinnati	MAIN 3929	Houston	C 6588									St. Louis	CE 3621	Toronto	RA 5191
Cleveland	EX 1177	Indianapolis	LI 9857	Los Angeles	TR 8713	Milwaukee	HO 5950	Montreal	HAR 4535	Orlando	6056	St. Paul	EN 2399	Tulsa	4-8841
Dallas	H 6818	Kansas City	HA 5857	Mexico City	J-27-95	Minneapolis	GL 1173	New York	MU 4-1514	Philadelphia	BAL 5850	Salt Lake City	3-9074	Vancouver	MA 2511

The DoALL Company Minneapolis 4 Minnesota

Telephone Your "DoALL" Sales and Service Store



Alcoa Aluminum

Now Available. Aluminum in rounds and hexagons; chamfered and ready to go to work in your screw machines. Alcoa's distributors maintain large stocks of standard sizes for your convenience.

You Pay 22.2% Less Today. The base price of 1-inch diameter Screw Machine Stock (Alcoa Alloys 11S-T3 and 17S-T) is 7 cents less per pound than in September 1939, a 22.2% reduction. Other Alcoa Aluminum Screw Machine Stock prices have dropped correspondingly—same high quality, same careful preparation of stock, same advantages.

Should you need help getting a job going, Alcoa's servicemen are ready to advise you. For this help, call our nearest office, or write ALUMINUM COMPANY OF AMERICA, 2112 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

BWH

DEPENDABLE RUGGEDNESS

112 TONS OF CRUSHED GLASS DAILY?

EASY WITH A TOUGH BWH BELT

PROBLEM: To haul 112 tons of crushed glass each 14-hour day — 365 days a year, and through drastic temperature changes.
SOLUTION: BWH "Bulldog" Belting, of course!

This rugged conveyor belting is made by the famous ROTOCURE process of continuous vulcanization that insures stamina and ease of operation, regardless of how abrasive the load. This BWH belt has run continuously since July 7, 1942, and . . , at a lower maintenance cost.

Through 65 years of leadership in the industry — BWH has pioneered the development of tough conveyor belts and other rugged products of dependability. Look to BWH for the solution to your tough problem!

HAVE YOU A JOB WHERE STAMINA COUNTS?

Bring us your toughest problems . . . we're specialists in solving them. Consult your nearest BWH distributor, or write to BWH direct.

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in All Principal Cities

WORKS: CAMBRIDGE, MASS.. U. S. A. • P. O. BOX 1071, BOSTON 3, MASS.

Length 32 in.
Width 12½ in.
Height 9 in.

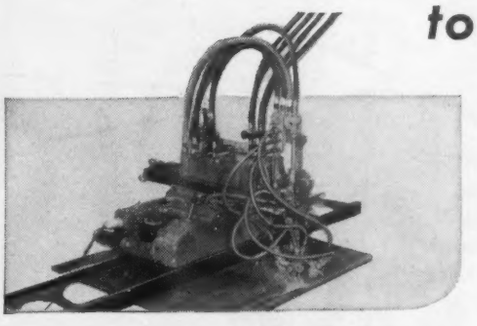
Speed – standard machine 2 to 50 inches per minute... high speed machine 7 to 210 inches per minute. Equipped with direct, continuous reading speedometer... inherently accurate.

Heavy Load Capacity – 500 lb.

Adaptability – Runs on special track, I-beams, or any flat surface.

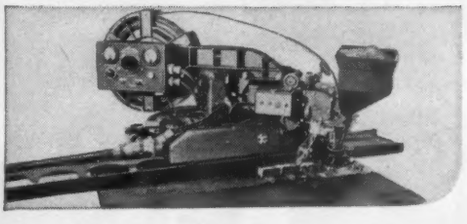
An Electric "PACK MULE"

to mechanize these processes



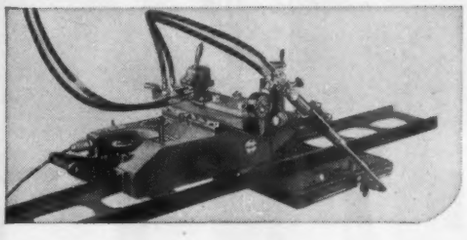
CUTTING

Straight Line Cutting
Bevel-Cutting
Heavy Duty Cutting
Plate-Edge Preparation



WELDING

UNIONMELT Automatic Electric Welding
HELIARC Welding
Mechanized Oxy-Acetylene Welding



HEAT TREATING

Flame-Hardening
Flame-Softening
Flame-Strengthening
Stress-Relieving

Ask Linde for more information

The words "Unionmelt," and "Heliarc" are trade-marks of Union Carbide and Carbon Corporation or its Units.

THE NEW CM-37 MACHINE CARRIAGE

THE LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation
30 E 42nd St., New York 17, N. Y. UCC Offices in Other Principal Cities
In Canada: Dominion Oxygen Company, Limited, Toronto

OLD MAN COMPETITION...

WIRE ROPE AND STRAND • FITTINGS • SLINGS
HIGH AND LOW CARBON ACID AND BASIC
OPEN HEARTH STEELS • COLD ROLLED STRIP
ROUND AND SHAPED WIRE • AIRCORD,
SWAGED TERMINALS AND ASSEMBLIES • AERIAL WIRE
ROPE SYSTEMS • ELECTRICAL WIRES AND CABLES • WIRE
CLOTH AND NETTING • SUSPENSION BRIDGES AND CABLES

JAR ROEBLING

ROE

PACEMAKER

IS GETTING READY

Let Roebling strip steel help keep your costs down!

TO MEET COMPETITION, those glittering new products will depend for success on their ability to be produced with maximum uniformity of specifications. Net result—fewer rejections, costs kept down!

Roebling craftsmen are past masters in matching manufacturers' specifications. If *your* new product is made from Roebling strip steel, round, flat or shaped wire—it's off to the right start, production-wise and cost-wise. In temper and finish, in steel analysis and dimensional uniformity, Roebling material is *right* and ready for your machines.

Roebling equipment and facilities are up-to-date, complete, *unexcelled.* Skilled workmen are schooled in thorough-going Roebling methods developed in a century's experience with wire. This combination, with the help of Roebling engineers, can be turned into low-cost production for you. As a first step in meeting competition, why not call at our nearest branch office?

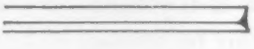
JOHN A. ROEBLING'S SONS COMPANY
TRENTON 2, NEW JERSEY
Branches and Warehouses in Principal Cities

BLING

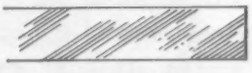
IN WIRE PRODUCTS

ROEBLING PRODUCTS

Round Wire



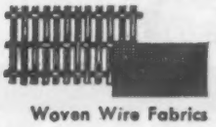
Shaped Wire



Flat Wire

Wire Rope

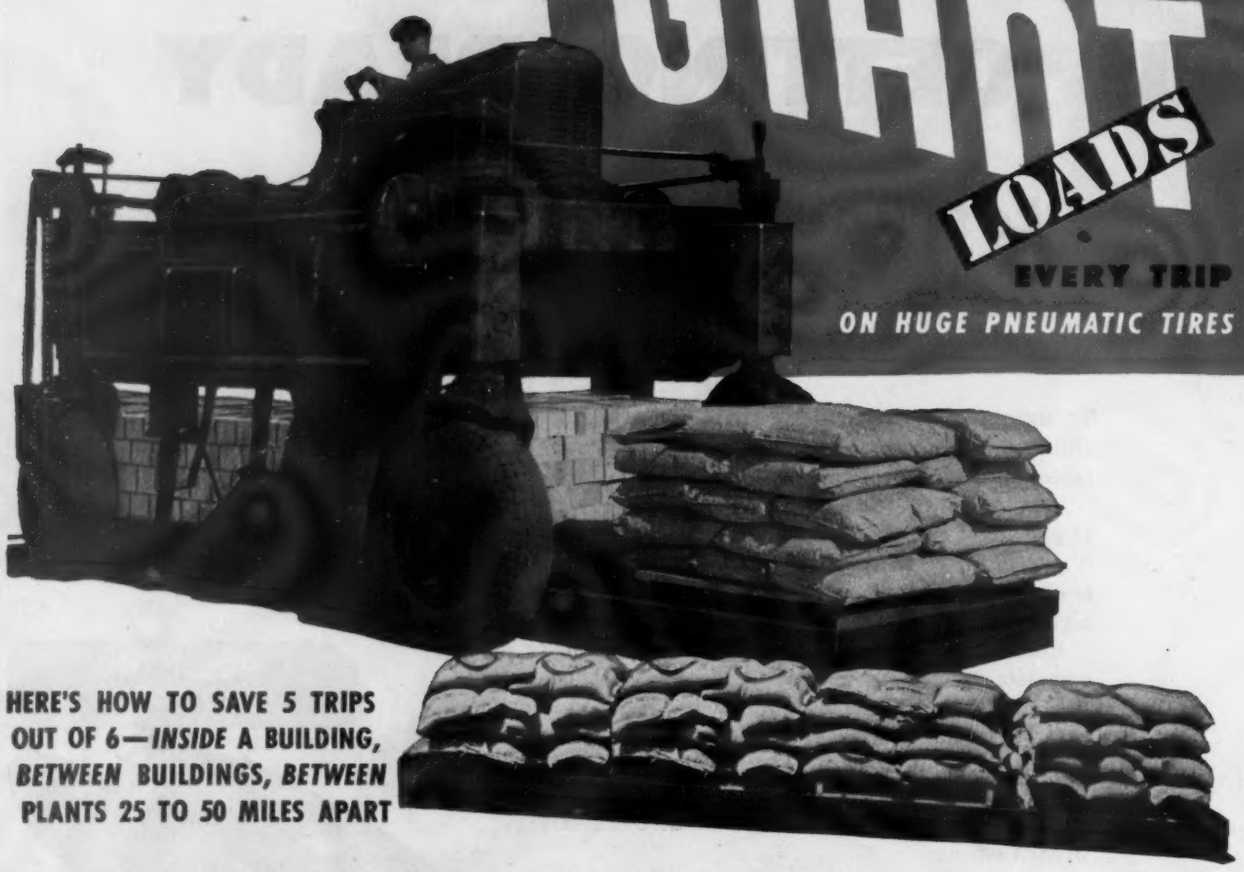
Electrical Wires and Cables



Woven Wire Fabrics

GIANT LOADS

EVERY TRIP
ON HUGE PNEUMATIC TIRES



HERE'S HOW TO SAVE 5 TRIPS OUT OF 6—*INSIDE* A BUILDING, *BETWEEN* BUILDINGS, *BETWEEN* PLANTS 25 TO 50 MILES APART

ROSS Giant-Load Straddle Carriers—like the one pictured here, are carrying 6 or more ordinary loads every trip in a plant of one of the world's largest companies. Their Materials Handling and Engineering Personnel developed and built the huge Master Pallet illustrated, on which 6 or more small Pallets or a tremendous amount of bulk material can be loaded.

Load handling is entirely mechanical. The Ross Straddle Carrier straddles the Pallet, slides its load-carrying hooks under the Master Pallet, lifts it by power and starts on its way when the load is clear of the ground, operates at speeds up to 20 miles per hour.

This is only one of hundreds of uses for Ross Pneumatic-Tired Straddle Carriers, which have capacities from ONE to TEN tons. Load is underslung, has lower center of gravity than any other wheeled vehicle, can negotiate rough or tippy roads. Safe—Load can't roll or slide off. Runs forward or backward with equal facility. Long materials loaded longitudinally, extending beyond Carrier at both ends.

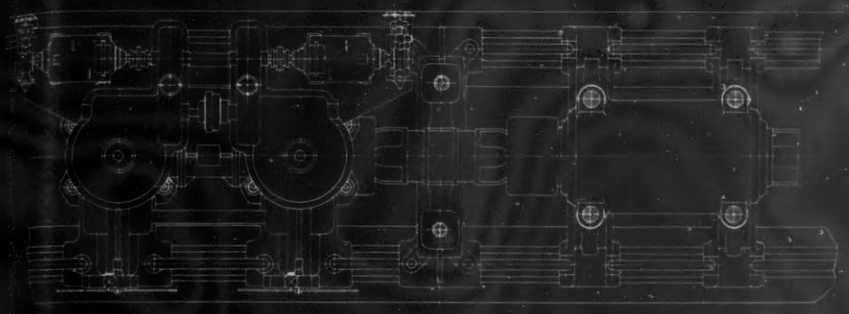
Want more information? A letter or postcard will bring it.

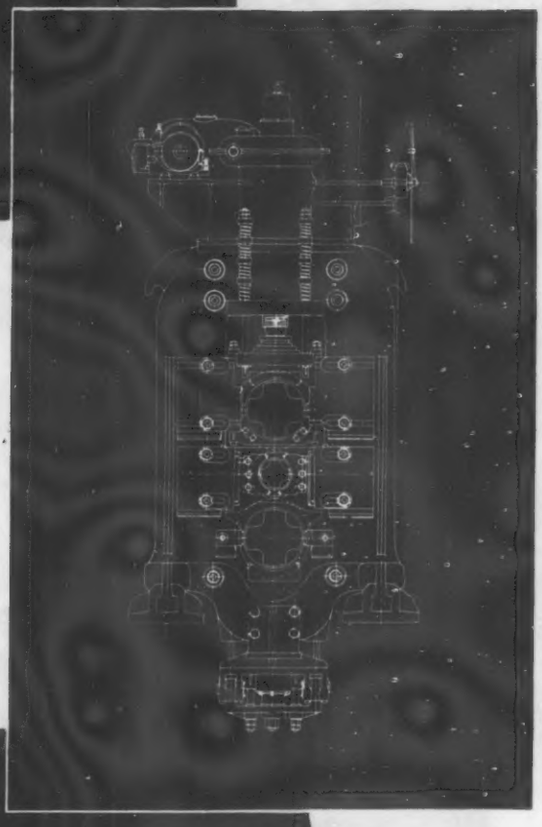
Ross Giant-Capacity Fork Lifts. No ordinary Lift! Handles loads up to 9 tons—stacks up to 22 feet high. Investigate!

ROSS
GIANT LOAD
STRADDLE-CARRIERS & LIFT TRUCKS

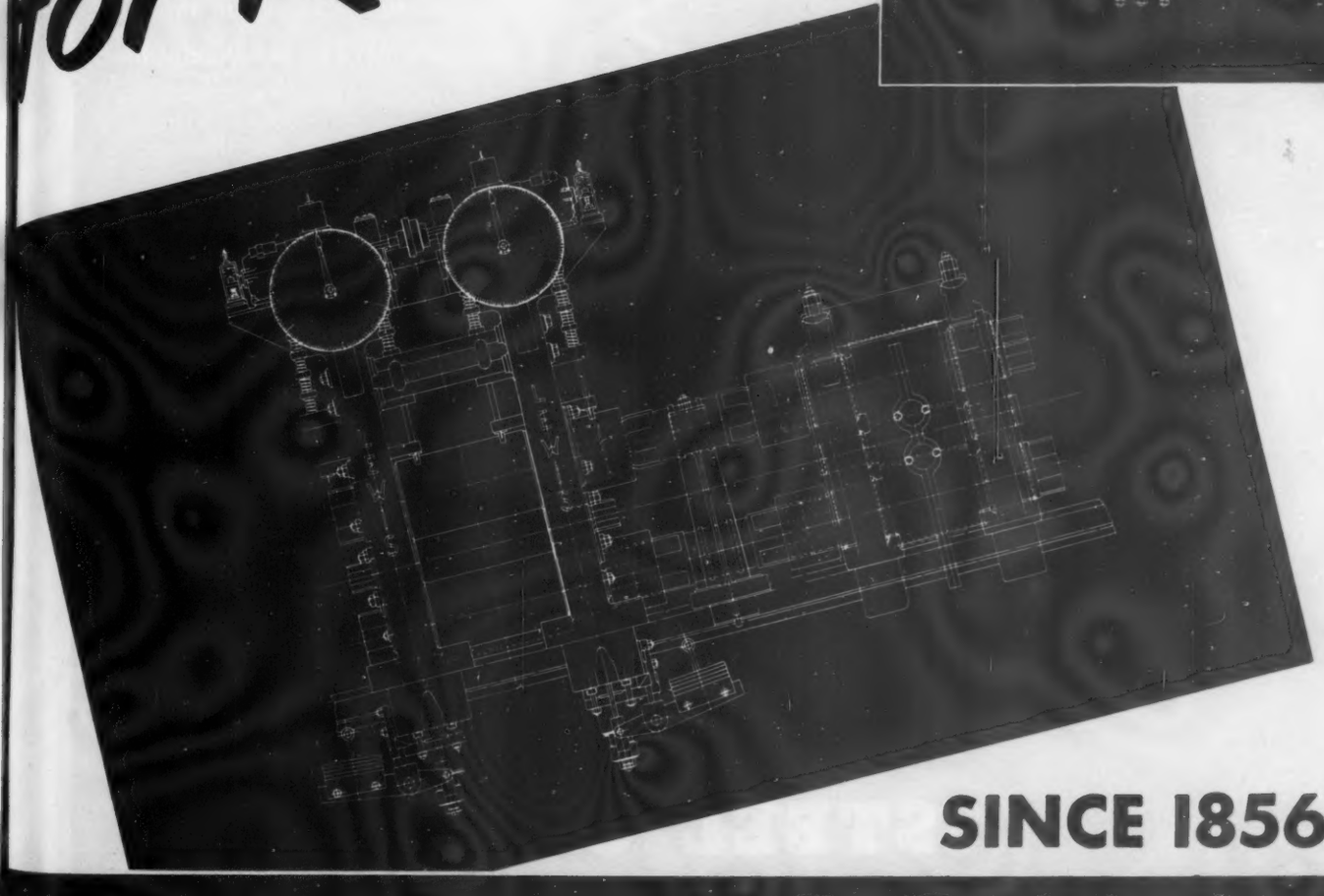
ROSS CARRIER COMPANY • Benton Harbor, Michigan

Branches: Seattle • Portland • San Francisco • Vancouver, B.C. • New York City • Mahwah, N. J.





Design for Rolling



SINCE 1856

LEWIS FOUNDRY & MACHINE

DIVISION OF BLAW-KNOX COMPANY, PITTSBURGH, PA.

FIRTHITE

faced 32 instead of 6 pieces per grind

Conditions:

- Depth of cut . . . . . 3/8"
- Feed per revolution . . . 1/32"
- Cutting speed 235 ft. per minute

Cutting speed was also increased from 100 feet per minute to 235 feet per minute. No wonder the customer said, "A marvelous work value on this job."

If YOU have a cutting problem . . .

Call Firth-Sterling STEEL COMPANY

McKeesport, Pa.—New York, Hartford, Philadelphia, Pittsburgh, Cleveland, Dayton, Detroit, Chicago, Los Angeles

from the CARDOX case record...

Out of actual on-the-job fire experience comes evidence that Cardox Fire Extinguishing Systems provide a scope of carbon dioxide performance... and standard of effectiveness . . . far beyond the generally recognized advantages of this fast acting, non-damaging, economical extinguishing medium.

File No. S-65, covering an investigator's report on Cardox extinguishment of an oil reclamation plant fire, offers an interesting example of Cardox protection by total flooding . . . one of the many types of protection made most effective by Cardox methods of controlling and applying carbon dioxide:

"Officials of the company were highly pleased with the speed and effectiveness of the Cardox System in extinguishing a fire in the company's big *Oil Reclamation Room*—one of nine rooms and a long pipe tunnel protected by this Cardox System.

"The fire was caused by the overheating of a refining unit, causing the oil to boil over. This oil, which has a 450° F. flash point, was estimated to be at 550° F. when it boiled over. It immediately burst into flame, creating a large, hot fire.

"However, the thermostat immediately actuated the Cardox System. Approximately 5½ tons of Cardox CO_2 were released . . . instantly extinguishing the fire, and totally flooding the room with carbon dioxide. The only evidence of the fire was the paint burned off the refining unit in which the blaze originated. Normal operations were resumed in less than one hour."

The danger spots in your plant may not be similar to the one described in File S-65. But, if they involve flammable liquids, electrical equipment or hazardous manufacturing operations, Cardox offers a new scope of protection you should investigate. By increasing the performance effectiveness of carbon dioxide . . . by making it practicably available in a single system for use in *tons* for large fires or *pounds* for small ones, with ample reserve for new emergencies . . . Cardox has set new high standards of protection for many of the most severe hazards in American Industry.

An analysis of your fire hazards by Cardox Research Division and Engineering Staff puts you under no obligation. Write for Bulletin 826.

CARDOX
CO_2 FIRE EXTINGUISHING SYSTEMS

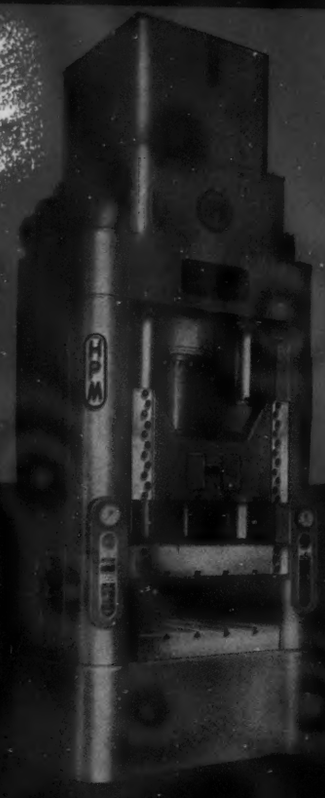
CARDOX CORPORATION

BELL BUILDING • CHICAGO 1, ILLINOIS

District Offices in

New York • Philadelphia • Washington
Pittsburgh • Cleveland • Detroit
Cincinnati • Houston • San Francisco
Los Angeles • San Diego

Draw it Hydraulically!



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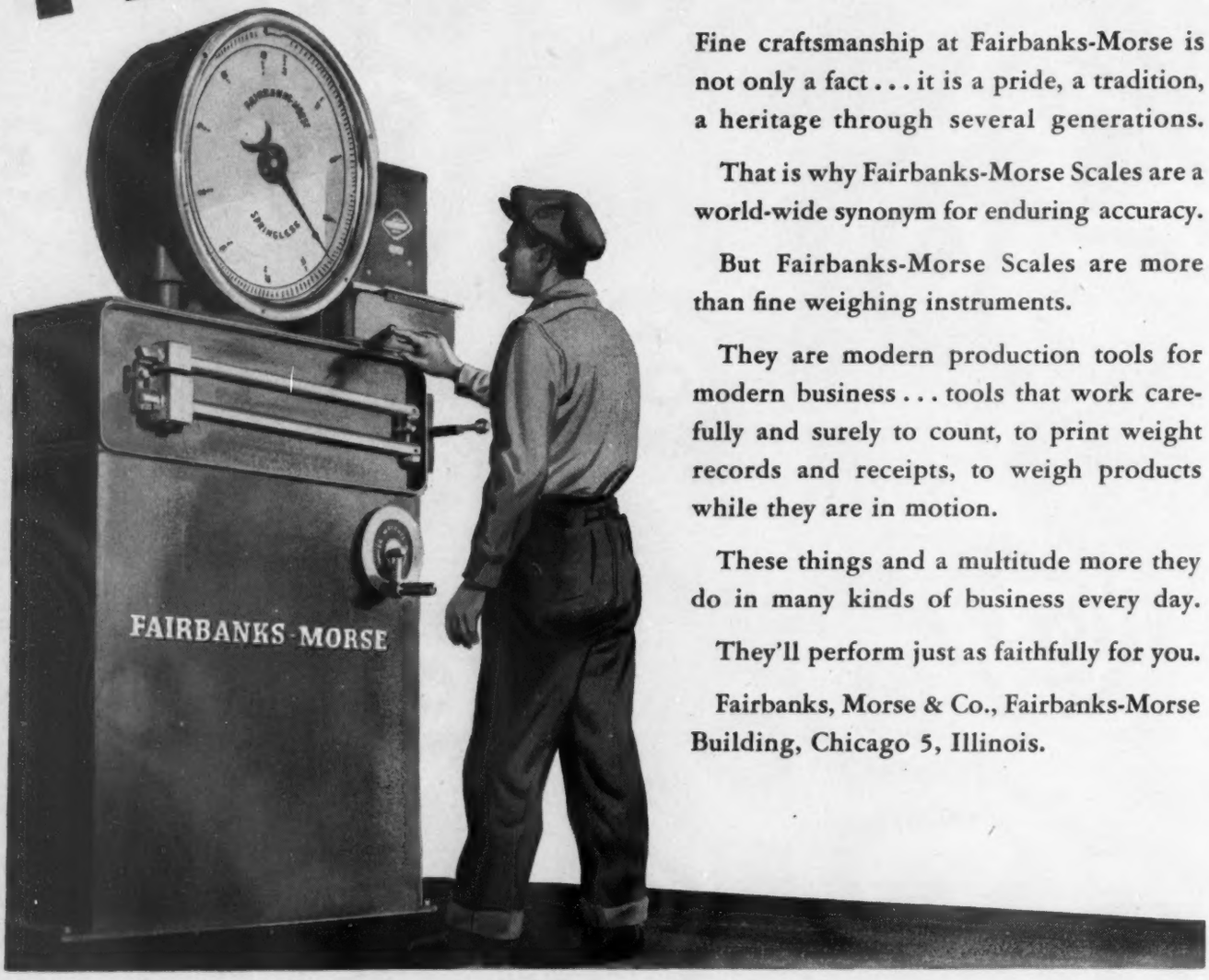

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STEEL

The Magazine of Metalworking and Metalproducing

VOL. 118, NO. 7 Feb. 18, 1946

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ARMY ★E NAVY

UNION CHAINS

As the EDITOR VIEWS the NEWS

Which System?

In his pre-election speech of Feb. 9, Premier Joseph Stalin criticizes the capitalistic system and extolls the Soviet social system on a count that will be interesting to American industrialists. He charges that industrialization of an agrarian nation under methods of the capitalistic system is too slow and ineffective.

In capitalistic countries, says Stalin, industrialization starts with the light industries "because they do not require large investment of capital." After the light industries have made profits and as accumulated savings mount, funds become available to finance heavy industry. This process, characteristic of the capitalistic system, is too slow for Russia. Therefore, the Communist party evolved a program of five-year plans.

Here Premier Stalin points with just pride to Soviet achievements in industrialization. In 1913, Russia produced 4,230,000 tons of steel. This was the economic base upon which old Russia was to wage World War I. In 1940, Russia produced 18,300,000 tons of steel. This was the economic base upon which Soviet Russia was to wage World War II. Stalin attributes the increase in productivity to the Soviet system. He declares the record is unprecedented and that it proves the superiority of the Soviet method over non-Soviet methods.

The first five-year plan began to yield results in 1928. Steel output in Russia in that year was about the same as in 1913—4,230,000 tons. Therefore the rise to 18,300,000 tons in 1940 represents a gain of 333 per cent in 13 years. It happens that steel output in the United States of 4,502,395 net tons in 1893 corresponds closely with Russia's output in 1928. Output in the United States in 1905 was 22,426,821 tons, a gain of 398 per cent in 13 years. Thus the profit system, working with the limited "know how" and equipment of the nineties and stimulated only by the demand of a peacetime era, registered more rapid progress than the Soviet system, working with the world's advanced knowledge of the thirties and stimulated by the urgency of preparing for inevitable war. Russia's achievement is admirable, but it is not unprecedented.

Stalin's speech accentuates the issue as to whether the postwar world is to go forward with the Soviet or the American system. For example, if China is to industrialize, will it be under Communistic or capitalistic auspices?

The question puts a terrific responsibility upon government leadership in Washington, which at the moment is rapidly dissipating the hard won prestige of the superior American system.

STEEL
February 18, 1946

THE GREAT GAMBLE: Henry Ford II performed a great public service when he gave a San Francisco audience chapter and verse of the manner in which OPA rulings are hampering American business.

He showed that manufacturing costs on 1946 Fords total $962 per car. Sales and distribution costs bring the total cost, with no allowance for profit, to $1041.26. OPA set the ceiling price at $728. This is the price Ford is permitted to charge dealers.

His case for parts suppliers is equally impressive. A supplier had been selling parts to Ford for 50 cents each. Rising costs caused the supplier to ask permission to charge 61 cents. OPA ruled he could charge only 54 cents. The supplier discontinued production of the part. Two new suppliers now are furnishing it, one at 82 cents and the other at 85 cents, with full OPA approval.

Henry Ford II says Ford Motor is taking "a big gamble." It is assuming the price ceiling problem will be solved. It is staking its war earnings on this gamble.

Smaller companies, lacking the resources of Ford

(OVER)

Motor, have three alternatives. They too can take the big gamble; they can go into some other line of business; or they can close up shop.

This is a stiff price to pay for government stupidity. —p. 77

• • •

INDUSTRIAL MEDICINE: Every manufacturer knows that he has an obligation and an opportunity to improve the physical well-being of his employees through industrial medicine, health promotion and safety practices. Sometimes, however, it is an open question as to how far the employer should carry his activities in this field.

For instance, should a company rely upon its own medical organization and its own hospital facilities or should it have working arrangements with the doctors and hospitals in the community? At what point in the case of an ill or injured employee does the responsibility of a company doctor end and that of the employee's family physician begin?

Perhaps there is no simple answer to these and similar questions, but we believe that most industrialists, after reading the description of the Bethlehem Steel Co. program for employees' health and safety by Dr. Loyal A. Shoudy, medical director, will agree that it reveals policies derived from sound experience which will help to answer many of these questions. —p. 80

• • •

STEEL AND SECURITY: Present at a seminar held by the Army Industrial College were representatives of the armed services, the steel industry, Bureau of Mines, Department of Commerce and the Senate Military Affairs Committee. They discussed informally factors that will be important in maintaining the steel industry in the state of health and efficiency that will be required for national security.

They agreed that it is impossible now to predict the amounts and kinds of steel that will be needed in the next war. They discussed iron ore and its beneficiation, coking coal, geographical distribution of steelmaking facilities, stockpiling of critical materials, the role of scrap in wartime, blast furnace reserves and the shortage of technical men.

Many interesting views on these subjects—some of them highly controversial—were expressed. We commend the resume of the seminar to our readers, knowing full well that they will find it provocative of thought on future policy. —p. 73

SIGNS OF THE TIMES: Of 10,000 machine tools earmarked by the Ordnance Department to be put in storage for "the next war," 6500 already have been "processed" (p. 70), meaning they have been taken down, cleaned, covered with protective coatings, reassembled, packaged in waterproof containers and stored. . . . The Tucker Torpedo, radically styled passenger car designed by Preston Tucker, appeared a step closer to realization (p. 78) following announcement that a number of prominent automotive executives are to be associated with the designer. . . . Boston & Maine Railroad is joining standard length rails by oxyacetylene pressure-welding into quarter-mile lengths (p. 110) before laying them in the 5-mile long Hoosac tunnel near North Adams, Mass. . . . Curtailment of commercial, industrial and high-cost residential building will be ordered soon by Civilian Production Administration in order to channel scarce materials into low-cost homes. Any one starting construction now, warns CPA Administrator Small (p. 66) "runs the risk of not being permitted to finish the job." Many will shiver at the confusion this proposal will entail. . . . Through new five-year plans, Soviet Russia hopes to expand production of pig iron and steel ingots to 50 million and 60 million tons annually, respectively (p. 64), according to Premier Stalin's pre-election speech of Feb. 9. . . . While Washington tries belatedly to draft a wage-price formula, the need of which could have been foreseen months ago (p. 61) the effect of the needlessly prolonged steel strike is beginning to hit the national economy hard. On the West Coast, this is the time of year (p. 67) when can makers should be preparing cans or can material for next summer's fruit and vegetable packs. Six major can making plants are closed by strikes. Even if they were not affected by these walkouts, they could not operate because no tin plate is available. The prospect in the food canning industry is dubious. . . . Another casualty is the steel export program. Last fall the Office of International Trade asked CPA to find 4 million tons of steel for reconstruction in occupied Europe. This was scaled down to 840,000 tons for the first half of 1946. Now it is doubtful whether this can be provided (p. 63) unless it is to be made up by taking steel, after production is resumed, from tonnage that would have been earmarked for domestic use had the strike not occurred.

E. C. Shane

EDITOR-IN-CHIEF

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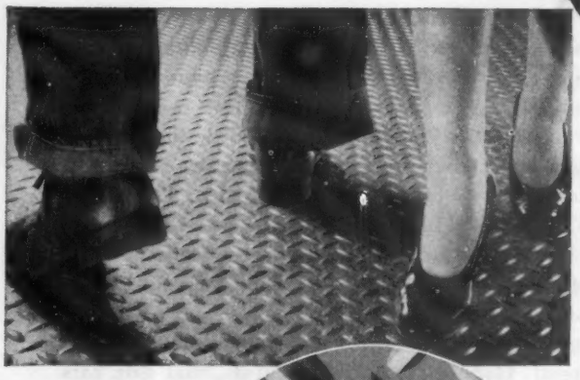

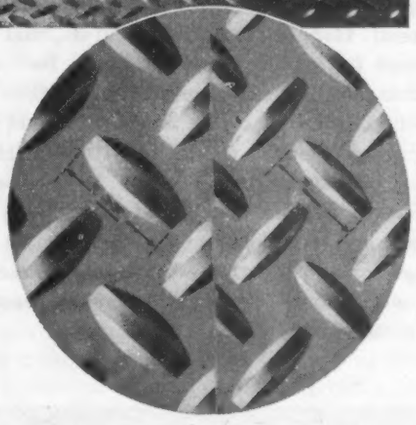

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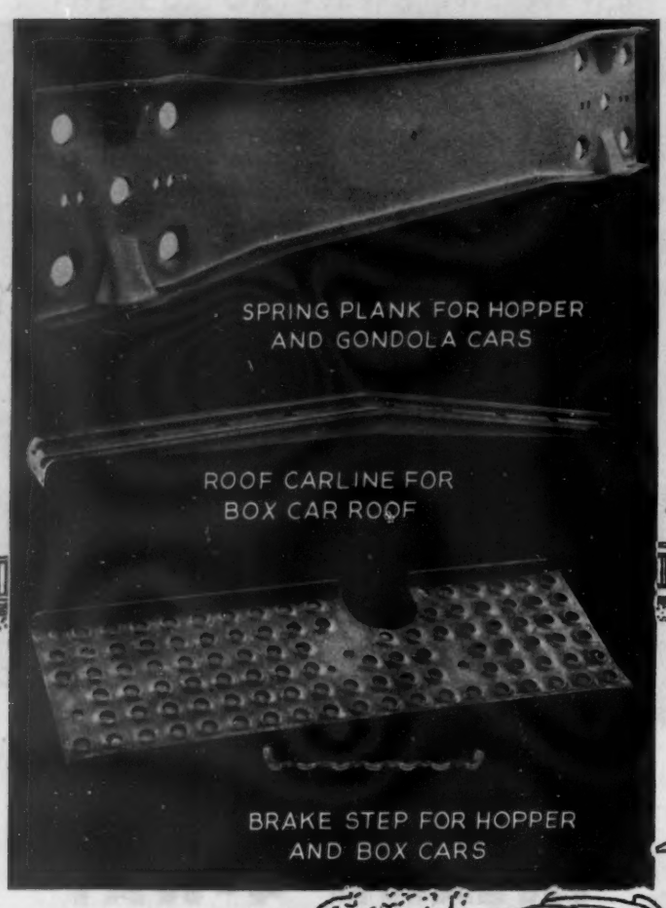
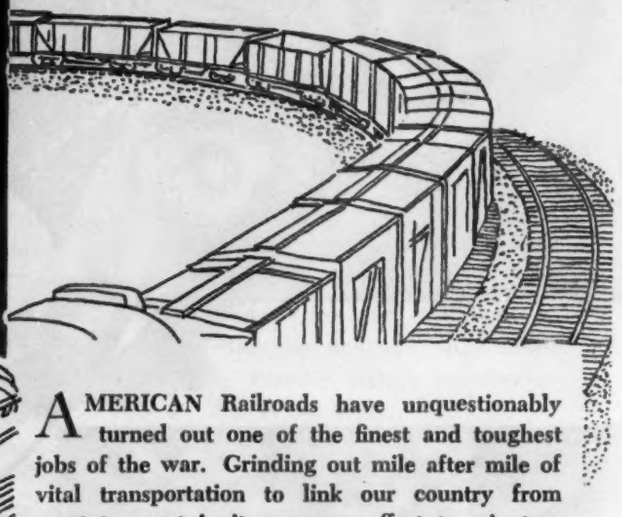
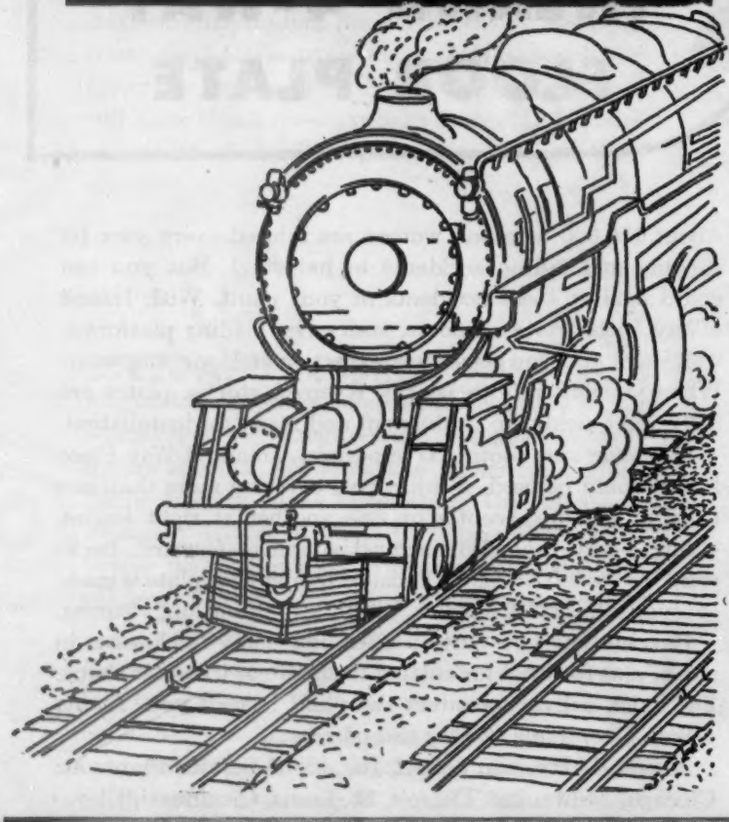


Here is TOMORROW





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STEEL
February 18, 1946

PAUL PORTER

JOHN W. SNYDER

CHESTER BOWLES

Shift in administration economic personnel rumored in Washington last week would elevate Mr. Bowles to the Office of Economic Stabilization, Mr. Porter to the Office of Price Administration, while Mr. Snyder would continue as reconversion director. NEA photos.

Post-Strike Problems Will Be Complicated

Adjustment of steel-consuming industries to meet higher steel prices and higher wage rates while prices of their products are frozen may require months. Speedy resumption of production of civilian goods may hinge on policy on passing along increases

SETTLEMENT of the month-old steel strike on the basis of higher wages for the steelworkers and higher prices for steel products will not, as popularly supposed, promptly solve the wage-price problems of the metalworking industry. Rather it will require new and extremely difficult adjustments by a large majority of steel-consuming companies—adjustments which possibly may take months to effect.

The administration's delay in announcing its long overdue wage-price policy has been holding the problem in a state of suspended animation. Wrangling over the details of the policy while the basic steel industry was almost completely shut down and while steel consumers ran out their slender stocks of steel has given rise to considerable criticism of the administration. Industry observers point out that the fundamental facts in the situation were obvious several months ago and that a wage-price policy could and should have been formulated before the steel strike started.

Out of the plethora of rumors, "leaks" from "high administration sources" and known facts, the settlement late last week appeared to take this form: 1. Steel workers will get an increase of 18½ cents an hour as recommended by the President; 2. producers will be granted price increases amounting to $5 a ton or slightly more on carbon steel (although the announced White House increase covering all steels may be lower); 3. accompanying announcement of this formula will be announcement of a rearrangement in the administration's economic division.

On this basis, it was believed the large basic steel producers and the union would resolve their dispute and end the strike, although the price increase would be less than that asked by the producers to compensate for increased costs absorbed during the war and leave nothing to compensate for the wage increases now being asked by the steelworkers.

Administration officials indicated that the increases would apply chiefly to carbon steel products and that OPA would attempt to distribute these increases to the advantage of the smaller, nonintegrated producers. For example, galvanized sheets would be increased more than hot-rolled carbon sheets and hot-rolled bars.

No price increases were contemplated for alloy steels, which might make the overall increase announced by the White

House somewhat less than the $5 average for carbon steels.

The new wage-price formula is expected to provide a national pattern. However, practical application of this pattern to all industries obviously would require many exceptions. One question which is reported delaying promulgation of the policy is the suggestion of reviving wartime wage controls.

The White House announced early last week that announcement of the new wage-price policy would be accompanied by a shift in top personnel of the administration's economic divisions. Washington newsmen reported this meant that Chester Bowles would move into the Office of Economic Stabilization, replacing John C. Collett, that Paul Porter of the Federal Communications Commission would succeed Mr. Bowles in OPA, and that John W. Snyder would continue as reconversion director but would concentrate mostly on production. These shifts had not been confirmed by week's end and, in fact, rumors were recurrent that Mr. Bowles might resign from the administration if the wage-price policy were not to his liking.

United Steelworkers in Minnesota joined the national steel strike three weeks late because of the Minnesota law which calls for a 30-day waiting period before a strike can go into effect. Photo shows pickets at the Duluth plant of American Steel & Wire Co. NEA photo

Cost Absorption Policy Favored

Mr. Bowles reportedly opposed steel price increases as large as those favored by other administration officials. During his administration of OPA, Mr. Bowles generally has insisted on a policy of cost absorption wherever possible and it is believed he will continue on this course if and when he succeeds to the stabilization office.

How far the cost absorption policy will be pushed remains to be seen. Will distributors be permitted to pass along the increased steel prices? How soon and to what extent will steel consuming industries be granted price relief on their products to compensate for the increased steel prices and the higher wages which now will be demanded of them?

These post-strike adjustments may pose problems just as difficult and certainly more complicated than those in the basic steel case.

Where the iron and steel producing industry comprises about 275 companies operating about 400 plants, employing about 530,000 workers, the metalworking industry as a whole comprises 28,000-odd plants, employing more than 3,500,000 workers and normally producing more than a third of the total national output of manufactured goods.

The majority of these companies buy steel as their basic raw material. Under the strike settlement terms they will be compelled to pay higher prices for their raw material and pay higher wages to their employees while in the meantime their own fabricated products are held to price limits established by the Office of Price Administration.

So diversified are the products and operations of these 28,000 companies and so complicated are their cost problems that, even if the OPA were minded to allow them fair price increases, months of study would be required to make the upward adjustments. One metalworking executive expressed the opinion "there are not enough accountants and analysts in the whole country to make such a study." The same observer doubted that any general formula could be evolved under the present price control setup to allow fair and equitable increases.

Most of these companies already have absorbed heavy increases in costs without adequate compensatory price increases. Many now contend their cost and price position is so unbalanced as to preclude profits, regardless of volume of business.

Under these conditions, metalworking managements lack incentive to achieve full production. Some may be forced to close or to discontinue certain lines on which losses are incurred.

Meanwhile, the indicated policy of OPA will continue to be the forcing of absorption of cost increases—by the manufacturer, distributor and retailer. This policy offers little promise of early substantial price adjustments to offset the higher wage and material costs.

How will this situation affect post-strike steel demand?

Some observers believe steel users will be anxious to build up their inventories after the mills reopen and that demand will be greater than supply throughout the remainder of the year. During the past four weeks, production of approximately 6 million tons of ingots has been lost. Before the mills are able to resume full operations this loss will be increased by at least 2 million, making a total loss of 8 million tons of ingots due to the strike. Assuming that the mills will be able to operate at an average of 90 per cent of capacity during the last ten months of the year, total ingot production for 1946 would amount to only about 73 million tons, equivalent to slightly more than 50 million tons of finished steel. Some observers believe this will be inadequate to meet the accumulated deficit in demand for civilian goods. They suggest that some form of allocation may be necessary to distribute the available steel. Producers were operating on a voluntary allocation plan before the strike started.

Other observers believe the combination of higher wages and higher prices for steel will create such chaos among metalworking firms that production will be slowed down and the demand for steel seriously and adversely affected.

Meanwhile, operations of metalworking companies continued to decline sharply last week as stocks of steel dwindled or became depleted. Many plants were closed completely, others continued operations on a curtailed basis. Ford and Lincoln automobile assembly lines were down completely and activity in these plants was confined to producing parts.

Several weeks or more will be required

(*Please turn to Page* 171)

Senate Small Business Committee Considers Steel Pricing Problem

Difficulties encountered by fabricators and small manufacturers under OPA price policies aired at hearing. Pattern is sought for stimulating production of less profitable steel products which producers have dropped or curtailed

WHEN the OPA gets the "go ahead" sign from the White House as to the number of dollars per ton the price of steel may be advanced to compensate the industry for cost increases incurred in the past, plus those which will result from an increase in wages in settlement of the present strike, further dickering may be required before OPA reaches agreement with the industry as to how this price advance should be applied to the various finished steel products.

This likelihood was revealed at hearings of the Senate Small Business Committee held in an attempt to determine what action may be taken to prevent continuation of a recent trend in the industry to discontinue or reduce production of steel products which have been sold at a loss, or with an unsatisfactory amount of profit, under OPA ceilings. Galvanized sheets were cited specifically; it was reported that one mill which has been producing galvanized sheets at 25,000 tons per year has decided to go out of this business, and that a number of mills have curtailed their output of this product.

Lists Price Increase Principles

Warren M. Huff, chief, OPA Metals Price Branch, told the committee the distribution of the steel price increase should be made on the basis of several principles:

"First, it should be made on the relative profitability of products.

"Second, we ought to put into effect the recommendations of our extra committees. We have before us recommendations from industry committees on small orders. We think those should be placed into effect so that there will be no incentive—or at least that we will diminish that incentive—towards large orders on the part of the mills. We cannot go all the way, but we ought to go as far as we can in that direction.

"Third, we ought to adjust prices in such a way as to prevent a squeeze on the fabricators and intervening producers of steel who now buy steel and either roll it or fabricate it into the further products.

"At present OPA is faced with a demand from the steel industry that the increase be across the board, uniform for all steel products," he pointed out.

"If we are given authority to go ahead we will, insofar as we can, adjust the disparities between products that are seriously out of balance with the whole production.

"But," continued Mr. Huff, "irrespective of how hard we try—if we are given the authority to do that job, we cannot establish for all steel products the same degree of profitability. It is a physical impossibility to average out and make each order and each product in the whole steel line yield exactly the same amount of profit.

It was disclosed during the hearings that a merger of CPA and OPA to control product mix of the steel mills is under consideration.

A significant statement was made by Patrick Treacy, director of CPA's Steel Division. Because of the steel strike, all AA and CC ratings have been suspended. But, he said, the rating procedure continues in effect and the current suspensions are only temporary. After production is resumed, there will be a "shakedown" period of four to five weeks during which the entire situation will be studied afresh. Priority ratings again will be available to consumers who find they need assistance in getting materials.

CPA cannot force anybody to make anything, Mr. Treacy said, pointing out, "we have priority authority only when a mill is operating. We cannot compel a mill to operate or produce a product. If the mill does not want to produce galvanized sheets we have no control."

As soon as steel production is resumed, said Mr. Treacy, tin plate output will be confined strictly to purposes of food preservation. "That may distort the mills' ability to produce other products," said Mr. Treacy.

Specialty steel tubing is in a bad way because of failure of the OPA to approve necessary price increases, Edward A. Livingstone, general sales manager, The Babcock & Wilcox Tube Co., Beaver

(*Please turn to Page* 173)

Steel Export Program, Disrupted by Strike, To Be Revived When Mills Resume

WASHINGTON

ONE casualty of the steel strike which is due for action at the earliest possible moment is the steel export program—at least that part which involves urgent requirements for rebuilding and rehabilitating occupied countries in Europe.

Last fall the CPA was called upon by the claimant agency, the Office of International Trade, Department of Commerce, to find 4 million tons of steel for occupied Europe. In view of the tight steel supply at that time, CPA and OIT representatives met with steel executives in New York in mid-December and at that time the 4 million tons were screened by the CPA down to 840,000 tons—which figure emerged as the bare minimum for the first half of 1946.

This figure included world tin plate requirements from the United States as well as the needs of the occupied countries. It included about 200,000 tons of tin plate, while the remainder comprised hot-rolled bars, structural shapes, sheet and strip, and wire and wire products. In response to a request by the steel men for directives covering the 840,000 tons, the OIT devised a Certified Export Order system under which "CXO" orders were to be issued within the quota set by the CPA. These CXO orders, it was intended, would be issued to the exporters who would, in turn, present them to the mills. But the plan was not frozen until the middle of January, at which time the steel strike was on the point of breaking. Hence no CXO orders were issued.

After resumption of production the OIT will present a new demand upon the CPA for shipment during the second and third quarters. How large a tonnage will be requested is not now known, but it probably will be larger than the 840,000 tons agreed on in December. First, it had been expected that the 840,000 tons to be shipped under CXO orders would be augmented by some tonnage picked up here and there without allocations. Second, requirements may have to be allocated for destinations other than the occupied countries of Europe; for instance, some of the Latin American countries now are in urgent need of steel which they would have gotten had the steel industry continued operating.

The Certified Export Order system set up in January continues in effect and future allocations will be covered by CXO orders.

Steel Production Capacity Cut

Drop of 3,614,720 ingot tons as of Jan. 1, 1946, reflects chiefly abandonment of older and less efficient facilities

STEELMAKING capacity in the United States as of Jan. 1, 1946, is rated at 91,890,560 tons of ingots and steel for castings per year, a decline from the wartime peak but by a wide margin the largest capacity ever available in this country in a peacetime year, according to the American Iron & Steel Institute.

In January, 1945, capacity was rated at 95,505,280 tons per year. The decline since then reflects chiefly abandonment of some of the older steelmaking facilities. During the war years, almost 14 million tons of new capacity were installed to meet emergency demands.

The current steel capacity is more than 20 million tons, or nearly 30 per cent greater than the capacity available in 1929, and is 10 million tons greater than was available at the outbreak of World War II.

At present, open hearth steelmaking capacity is rated at 81,236,250 tons per year, down about 2,900,000 tons from the rated capacity a year ago.

Electric furnace steel capacity is currently rated at 5,500,290 tons per year, up about 45,000 tons from a year ago.

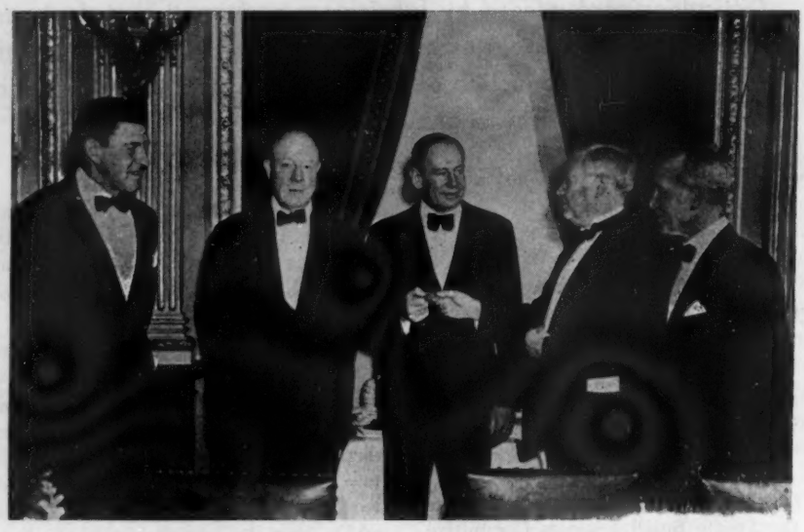
Bessemer steelmaking capacity, once the greatest of all from the tonnage standpoint, now stands in third place. At present, bessemer steel capacity is rated at 5,154,000 tons per year, against 5,874,000 tons per year on Jan. 1, 1945. The capacity for making steel by the crucible process is now rated at 20 tons per year, as against 3800 tons a year ago.

Blast furnace capacity increased slightly during the year and is now rated at 67,340,590 tons of pig iron and ferroalloys per year. On Jan. 1, 1945, blast furnace capacity was rated at 67,313,890 tons annually.

Erie Railroad To Install New Hulett at Cleveland

Cleveland's lake front ore-handling facilities will be greatly improved with the installation at the Cleveland ore dock by the Erie Railroad of a new 17-ton Hulett unloading machine.

The new Hulett was shipped from Chicago and will be in operation by the beginning of the 1946 season.



RECEIVES MOREHEAD MEDAL: Vice Adm. Howard L. Vickery, center, wartime vice chairman of the United States Maritime Commission, receives the Morehead Medal for "eminent leadership in advancing the use of oxy-acetylene processes for the efficient mass production of ships" at a dinner sponsored by the International Acetylene Association in New York. Photo shows, left to right: C. D'W. Gibson, Air Reduction Co. Inc., New York; John Motley Morehead, donor of the medal; Admiral Vickery; G. O. Carter, Linde Air Products Co., New York; Vice Adm. Emory S. Land, past chairman, United States Maritime Commission

New Russian Five-Year Plans Call for Huge Increases in Iron, Steel and Coal Outputs

THREE five-year plans, possibly more, may be required to boost Soviet Russia's production goals in steel, pig iron, coal and oil to a level close to that of the United States, Premier Joseph Stalin stated Feb. 9 in a pre-election address in which he outlined in some detail Russia's war production record and announced a program for tremendous expansion of existing industrial capacity in the Soviet Union designed "to guarantee our country against any eventuality."

In his address Stalin called for Russian production of 50 million tons of pig iron annually, 60 million tons of steel, 500 million tons of coal and 60 million tons of oil.

The magnitude of the industrial expansion projected is seen when it is borne in mind that as of 1940 Russia produced 15 million tons of pig iron, 18,300,000 tons of steel, 166 million tons of coal and 31 million tons of oil. However, the 1940 capacity reflected tremendous increases as a result of the various five-year plans which had been effected by the Soviets since the overthrow of the Czarist government. In 1913 Russia produced only 4,220,000 tons of pig iron, 4,230,000 tons of steel, 29 million tons of coal and 9 million tons of oil.

By contrast with Russia's expansion plans, the United States in 1944, the last full war year, produced 61,007,000 tons of pig iron, and 89,641,000 tons of steel, while American coal and coke production was estimated at 683,700,000 tons.

Stalin, discussing Russian war production, said that in the last three years Soviet industry produced on the average over 30,000 tanks, self-propelled guns and armored cars per year. Russian aircraft industry turned out about 40,000 planes a year, while in the same period her artillery industry produced about 120,000 guns of all caliber, about 450,000 light and heavy machine guns, over 3 million rifles and about 2 million automatic rifles. The mortar industry in the period 1942-44 produced on the average about 100,000 mortars per year. In 1944 alone Russian industry produced more than 240 million

shells, bombs and mines, and more than 7,400,000,000 cartridges.

In his address Stalin declared that World War II proved the triumph of Russia's socialist economy, attributing the cause of the war to "the inevitable result of the development of the world economic and political forces on the basis of monopoly capitalism." He declared that since the development of capitalistic countries was unbalanced, some lacking raw materials and markets, the world was split into conflicting groups, but pointed out that perhaps the catastrophe could have been avoided if the possibility of periodic redistribution of raw materials and markets between the countries existed in accordance with their economic needs, in the way of co-ordinated and peaceful conditions. This, however, was impossible under capitalism, he said.

Stalin, lauding Russia's war effort, predicted that Soviet scientists not only would catch up with those abroad, but would surpass them.

U. S. War Equipment Helped Russia Achieve Victory

Premier Stalin of Russia in his pre-election address to the Russian people took cognizance of the role which the United States and Britain played in the winning of the war. However, he made no reference to the material assistance afforded Russian arms by the United States.

That this was substantial was shown by the report last fall covering the last two years of the war by former chief of staff, Gen. George C. Marshall.

"The Soviet Union received thousands of tons of American raw materials to feed its own factories as well as fully fabricated equipment," General Marshall reported. "In the two years covered by this report we shipped the Soviets 28,356 jeeps, 218,888 trucks, 4177 tanks and 252 pieces of heavy artillery. The mobility and supply of the great Red Army was further increased by American locomotives, rails and rolling stock. Aircraft sufficient to equip two air forces the size of the Ninth were sent to the Soviets."

By contrast with Russian war production that of the United States during the war years stands out strikingly. Whereas Stalin reported Russian plane production during the war at 40,000 per year, United States output of military planes from July, 1940, through July, 1945, averaged 59,400 yearly.

In his report of last October, J. A. Krug, chairman, War Production Board, reported United States production for war in the five-year period included: Ships, 76,485, including 64,500 landing craft; 6500 other Navy ships and 5425 cargo vessels; rifles, carbines and sidearms, 17,400,000; field artillery and mortars, 315,000 pieces; tanks, 86,338; trucks, 2,434,553; small arms ammunition, 41,400,000,000 rounds; artillery shells, 4,200,000 tons.

Chairman Krug explained that some of this production went to Russia.

See War Ore Production Unchallenged for Years

Iron ore production in the United States in the five-year period 1941-1945 set a record likely to stand for many years, the Bureau of Mines reports. During this period 482 million gross tons of usable ore were produced; crude ore mined approximated 565 million tons.

Terminated war contracts, accompanied by decreased steel production, resulted in a 6 per cent drop in iron ore production in 1945 but total output of 88,754,000 gross tons was 20 per cent greater than the record peacetime year, 1940. Shipments of iron ore in 1945 decreased 7 per cent from 1944, totaling 88,156,000 tons. Estimated value of iron ore shipments in 1945 was $240,900,000, compared with $256,885,512 in 1944; average value per gross ton was $2.73 in 1945 and $2.70 in 1944.

Production and shipments of ore containing 5 to 35 per cent manganese were 1,390,000 tons and 1,445,000 tons, respectively.

Present, Past and Pending

■ STRIKE DELAYS REPORT ON U. S. STEEL SHIPMENTS

NEW YORK—United States Steel Corp. will not report shipments of finished products in January because it is unable to compile the necessary figures at this time.

■ PULLMAN-STANDARD PLANS TO BUILD 900 CARS A MONTH

BIRMINGHAM—Pullman-Standard Car Co. plans to build 900 cars a month now and 1400 cars monthly later at its Bessemer plant. Order backlog totals about 9000 units.

■ SURPLUS STEEL DISTRIBUTION PROBLEMS DISCUSSED

WASHINGTON—Methods of expediting sales and insuring equitable distribution of surplus steel were discussed last week at the first meeting of the Surplus Usable Steel Products Industry Advisory Committee, War Assets Corp.

■ AMERICAN CAN SALES INCREASE $15 MILLION IN 1945

NEW YORK—Net sales of American Can Co. increased nearly $15 million in 1945 to $242,351,862, the second highest in the company's history. Due to frozen selling prices coupled with higher labor costs and reductions in fees earned by wartime subsidiaries, net income declined over $1 million to $13,341,614.

■ BETHLEHEM STEEL HANDLES RECORD SHIP TONNAGE

NEW YORK—The four largest Allied transports were armed and converted by Bethlehem Steel Corp. which handled a record total of 37,778 ships during the war years. This armada represented a tonnage more than five times as great as the world's prewar merchant fleet.

■ AMERICAN SHIPYARDS MAKE RECORD DELIVERIES IN 1945

NEW YORK—American shipyards record deliveries in 1945 included 144 Liberty ships totaling 1,504,044 deadweight tons, 322 Victory ships of 3,378,043 tons, 525 turbo-electric drive tankers of 8,672,028 tons. The last of C-4 and P-2 transports, the diesel-propelled C1-M cargo ships, and the N-3 coastal cargo ships were completed in 1945.

■ KAISER PLANS MASS OUTPUT OF LOW-COST HOUSES

OAKLAND, CALIF.—Kaiser Co. plans to build more than 10,000 low priced homes throughout the nation to retail between $6000 and $8000.

■ AUTOMOTIVE INDUSTRY ABANDONS 1946 OUTPUT GOALS

CHICAGO—Automotive industry has abandoned its 1946 production goals of 1 million trucks and between 4 and 5 million passenger cars due to strikes and material shortages, George Romney, general manager, Automobile Manufacturers' Association, said here last week.

■ SCRAP SALVAGE CAMPAIGN PLANNED IN JAPAN

TOKYO—About 2 million tons of steel will be made available for reconstruction purposes in Japan during the next 18 months by smelting of metal in military weapons.

■ DRUG INDUSTRY HALTS REPACKAGING PROGRAM

NEW YORK—Substitution of metal containers for flimsy cardboard used by the toilet goods industry during the war period has been halted by the steel strike.

Low-Cost Homes To Get Priority For Materials

Pending CPA order will curtail all nonessential construction. Two-year goal is 2,700,000 homes

CURTAILMENT of commercial, industrial and high-cost residential building will be ordered soon by the Civilian Production Administration, it was reported last week as pressure for relief in the housing crisis increased.

Regulations on building controls and materials priorities are being drafted and will be issued as soon as completed. This move is being taken to channel scarce materials into emergency, low-cost homes. While details of the program have not been released, a government official says it is now planned to consider each construction application on an individual basis. Use of building materials will be approved only after consideration has been given to the progress which has been made on the project, essentiality of the construction to the reconversion program, the quantity of various materials which will be required, and similar pertinent factors.

Any one starting construction now "runs the risk of not being permitted to finish the job," CPA Administrator Small warned. The restrictions, he added, will be "drastic" and will require many sacrifices, but are considered by Wilson W. Wyatt, recently appointed national housing administrator and expediter, as absolutely necessary if his goal of 2,700,000 new low-cost homes within the next two years are to be attained.

Activity in commercial, industrial and public construction, which accounts for a large part of the consumption of steel in the building industry, will be slowed down by the diversion of skilled workers from this field to the residential building field as well as by whatever limitations are imposed by CPA in the pending order.

Practically all of Mr. Wyatt's proposed veterans' emergency housing program will be included in legislation now pending in Congress. Measures which he advocates include the start of construction of 2,700,000 low and moderate-cost homes by the end of 1947, including 1,600,000 conventional houses, 850,000 permanent prefabricated houses and houses assembled on-site from prefabricated parts and materials, and 250,000 temporary units (the previous all-time high was 937,000 homes built in 1925); greatly expanded production of conventional and new type materials by timely use of premium payments, guaranteed markets for materials manufacturers, priorities and allocations of equipment and materials, wage-price adjustments, use of war plants and new facilities, rapid tax amortization for plants which are newly built or converted to produce essential building materials, and absorption by government of undue risks in development work on new type materials.

He also advocates recruitment and training of 1,500,000 additional workers by the middle of 1947, postponement of all nonessential construction for the balance of 1946, rapid expansion of factory fabrication of materials and parts, priorities and allocations to home builders for equipment and materials, and curbing of inflation through more effective price control on building materials, ceilings on new and existing homes, and on building lots, and through the continuation of rent controls.

Housing Expediter Wilson W. Wyatt, left, explains his plans for over two million homes for veterans to Rep. Brent Spence (Dem., Ky.), chairman of the House Banking and Currency Committee. NEA photo

Jones & Laughlin Steel Corp. Issues Income Statement

Jones & Laughlin Steel Corp., Pittsburgh, reports net income in the fourth quarter of 1945 decreased slightly under that of the corresponding period of the previous year and that its total net income for 1945 rose slightly over that of 1944.

Net income for the last quarter of 1945 was $2,367,774, compared with $2,488,629 in the like period of the preceding year, and total net income for 1945 was $8,082,082 against $7,966,663 in 1944.

Net Earnings of National Steel Corp. Rise Slightly

National Steel Corp., Pittsburgh, has reported net earnings of $11,117,764 for 1945, which compares with $10,751,369 in 1944. Fourth quarter net earnings of $2,207,091 compared with $2,027,502 in the third quarter.

Net income in the fourth quarter of 1945 was 17 per cent less than the $2,670,396 in the corresponding period of 1944.

Continental Steel Corp. Reports 1945 Profit

Net earnings of Continental Steel Corp., Kokomo, Ind., increased in the last quarter of 1945 over the corresponding period of 1944, while net earnings for the year 1945 also increased compared with 1944. Although the 1945 earnings totaled more than those of 1944 there was a downtrend in quarterly earnings in the last half of 1945 as a result of rising raw material costs and stationary price ceilings.

Net income for the final quarter of 1945 was $113,412 compared with $64,759 in the last quarter of 1944. Net income for the year 1945 was $612,543 against $508,661 for 1944. The fourth quarter net income in 1945 was 18 per cent below the $138,567 pet earnings of the preceding quarter.

Pacific Coast Industry To Feel Steel Strike Effect for Months

With consumers' inventories rapidly nearing the vanishing point indications are many lines of manufacture and construction will be a long time attaining anything like normal operations after work is resumed

AS SUPPLIES of steel, and goods fabricated from steel, dwindle to the vanishing point in this area, it becomes increasingly apparent the most serious effects of the steel strike are still to come.

If the strike were to end immediately, it would require at least four weeks before the mills could reach a rate of operations sufficient to insure volume deliveries. Actually, it is likely several months will elapse before the supply situation returns to normal.

This prospect is made all the more acute by the fact that when the strike began inventories of steel and steel products were subnormal so that fabricating companies have had even less than usual inventory backlogs.

How serious the long-range repercussions of the steel strike may be on California's economy is indicated in the prospect for the food canning industry. This is the time of year when the can makers are preparing cans, or can material, for next summer's fruit and vegetable packs. However, none is being produced now. Six major can making plants have been closed by the strike, and even if they were not affected by walkouts, there would be no tin plate for them to operate on. How seriously this season's food pack will be affected remains to be seen, of course, depending on how long the strike lasts. In any event enough damage already has been done to make the prospect an extremely uncertain one.

Construction Industry Stalled

Something of similar character is taking place in the construction industry here. There is only one nail mill on the West Coast, that of Columbia Steel Corp. at Pittsburg. This 3000-ton a month plant of course is closed. When the strike began, nail inventories in retailers' hands were sufficient only for a day or so and they disappeared immediately. Already building is being halted everywhere because of the shortage of nails. There is a similar shortage of reinforcing rods and screening used in concrete structures, as well as scarcities of steel in other building lines. Structural material inventories are extremely low at present and the supply will be exhausted soon.

Aside from the direct effects of the steel strike, manufacturers are in serious condition as a result of shortages of machinery. One of the greatest needs is for electric motors. Machine tools of a wide variety of types are in urgent demand but cannot be had except for some second hand, obsolete models. Roller and ball bearings are needed by a number of companies.

Most manufacturers surveyed here believe it will be six months at the earliest, and probably a year, before they can begin getting the modern machines which they need and have on order. Estimates of deliveries even run as long as three years.

Corporations which require specialized, made-to-order equipment are hardest hit. Even in normal times it takes longer for machinery of this type to be produced. Now it is virtually impossible to obtain.

There is a heavy demand everywhere, too, for trucks, especially light trucks. The latter is particularly noticeable among small companies which are just starting to operate. A number of veterans who had hoped to go into business for themselves have had to delay or give up their plans because of inability to obtain trucks.

Five major shipyards on San Francisco Bay will be declared surplus property and put up for sale. They are the four Kaiser yards at Richmond and the Marinship Corp. yard at Sausalito. Many observers are doubtful if private buyers will be found for the installations.

On the other hand, four yards have been designated to remain under Navy and Maritime Commission jurisdiction. They are the Bethlehem yards in San Francisco and Alameda and the United Engineering Co. and General Engineering Co. yards in Alameda.

Several other private yards in this area, including Moore Dry Dock, Pacific Bridge Co. and Western Pipe & Steel yards, are privately owned and are not affected by any government orders. It is assumed they will continue in postwar operation.

The West Coast believes that it received a disproportionately low ratio of yards in the Navy and Maritime Commission allocations. In all, 42 shipyards will be operated by the two agencies in postwar. Twenty-four of these, however, are on the East Coast, and only 11 on the West Coast. The remaining seven are assigned to the Gulf Coast.

The Senate Small Business Committee has scheduled a new series of hearings on the effects of reconversion on small business firms. Under direction of Senator Murray of Montana, the hearings will begin in California Feb. 20. Three meetings are scheduled, in San Diego, Los Angeles and Fresno.

These field investigations will examine all reconversion problems of small businessmen who are unable to go to Washington to present their cases.

Manufacturing employment in the San Francisco Bay area in January ran counter to the general California trend by showing an increase from 80,000 workers in December to 82,000 in January.

Postwar Employment in Pacific Northwest Expected to Total 1,885,900 by Oct. 1

FIGURES released by the Committee for Economic Development anticipate that normal postwar employment in Washington, Oregon, Idaho and Utah will reach a level of 1,885,900 by Oct. 1, outstripping the 1940 top by 37 per cent. The report adds: "Our survey shows that the peak of unemployment in this region will be reached around March 31 when we may have 170,000 unemployed. Then the upswing will begin and by midsummer and no later than next Oct. 1, indications are practically all the workers in these four states will be employed."

Reconversion director has ordered several navy craft now under construction to be completed.

Reports from Washington, D. C., indicate an agreement has been reached under which Henry J. Kaiser will lease the government's aluminum plants at Trentwood and Mead, near Spokane, Wash.

Navy announces proposed expenditures of $2,299,000 at Todd Pacific plant at Tacoma where part of the inactive fleet will be moored.

Washington state will receive bids Feb. 26 for a 356-foot reinforced concrete bridge over the Wenatchee river and a 618-foot steel overpass in King county. On Feb. 14 bids were opened for bridges in Cowlitz and Clallam counties involving 450 tons reinforcing and 300 tons shapes.

Full Production Cited as Key To Prosperity

Important position of machine tool industry in promoting a prosperous economy is emphasized by association president

POSTWAR possibilities can be realized to their fullest extent only on the basis of maximum productivity, William P. Kirk, president of the National Machine Tool Builders' Association and vice president, Pratt & Whitney Division, Niles-Bement-Pond Co. of West Hartford, Conn., told the Northern New Jersey Chapter of the American Society of Tool Engineers at the chapter's annual meeting recently at Newark, N. J.

"There are many people in this country," Mr. Kirk said, "who seem to have the idea that wage rates and employment levels can best be maintained by limiting productivity per man per hour. This is an economic fallacy. The fact is that in the long run real wage rates and employment levels can be increased only in proportion to the extent to which productivity per man per hour can be increased.

Key to Prosperity

"The reason behind this fact is far deeper than a principle of economics. The basic reason is that there is no limit to human desires. The more things that people want, that can be offered to them at prices they can afford to pay, the larger will be the volume of business, and the greater will be the assurance of high wage and employment levels. The machine tool industry holds the key to this whole social and economic picture, because machine tools represent the key to cutting costs, increasing productivity, and lowering prices to the ultimate consumer."

He said that the Machine Tool Builders' Association has done its utmost to co-operate with the government in the disposal and placement of war-built government surplus machine tools.

International Nickel Opens Canadian Research Section

International Nickel Co. of Canada Ltd. has formed a Development & Research Section at 25 King St. West, Toronto, Canada, to provide Canadian industry with a complete consulting and technical service on metal problems.

BUFFALO BOLT SALES CONFERENCE: Representatives of the Buffalo Bolt Co. and its subsidiaries, Eclipse Lawn Mower Co. and S. M. Jones Co., are pictured at a recent sales conference in Buffalo. Top row, left to right: E. T. Larkin, W. E. Barfield, B. B. Dawes, W. C. Meeks, R. D. Dale, W. M. Ware, L. W. Fagg, H. McWorkman, L. J. Pundt, F. Stritmatter, K. L. Miller, C. Weigel, C. W. Turner, G. H. Ross, and C. H. Baldwin.

Middle Row: R. W. Rose, W. J. Phalen, C. A. Mesler, L. T. Finn, G. A. MacGregor, R. E. Thompson, F. Stoll, W. G. Flanigan, A. E. Clausen, W. Clausen, D. Myers, W. E. Harvey, C. E. Zettel, and D. T. Sinclair.

First Row: T. J. Usher, C. Curtiss, A. A. Binkerd, A. G. Witt, J. C. Walker, president, Buffalo International Corp.; C. N. Turner, general manager, Eclipse Lawn Mower; C. L. Turner, vice president, sales, Buffalo Bolt; R. B. Flershem, president, Buffalo Bolt; M. B. Jones, vice president, S. M. Jones; L. L. Hurd, sales manager, Buffalo Bolt; J. J. Whittington, W. M. Jillson, C. L. Lane, and W. R. Petillon.

BRIEFS . . . .

Paragraph mentions of developments of interest and significance within the metalworking industry

Steelcraft Engineering Co., Cincinnati, has changed its name to Steelcraft Mfg. Co.

—o—

West Co. Inc., Philadelphia, has sold its Abrasive Division to a newly-organized company, West Abrasives Inc. The new company is associated with General Grinding Wheel Corp., Philadelphia, and will continue to produce rubber bonded cutting, grinding and polishing wheels.

—o—

Hill Acme Co., Cleveland, has appointed Giebel Inc., New York, as representatives for northern New Jersey, eastern New York and Connecticut.

—o—

Leslie Co., Lyndhurst, N. J., regulator and controller manufacturer, has appointed the following agents to handle sales and service: Walz & Krenzer Inc., Rochester, N. Y., for midwestern New York; Gulf Engineering Co. Inc., Savannah, Ga., for southeastern Georgia; and Robinson Electric Co. Ltd., Vancouver, B. C., for British Columbia.

—o—

Reliable Spring & Wire Forms Co., Cleveland, has appointed the following as sales agents: W. E. Fry & Co., Kansas City, Mo., for Kansas and Nebraska; R. P. Vallee, Milwaukee, for the Milwaukee district; L. N. Finch, New Hyde Park, Long Island, N. Y., for metropolitan New York; H. P. Fillmore, Buffalo, for western New York; C. W. Weston, New Orleans, for southern Mississippi; and J. A. Campbell, Dallas, Tex., for Texas.

—o—

Superior Type Co., Chicago, has changed its name to Superior Marking Equipment Co.

—o—

Ashton Valve Co., Cambridge, Mass., has acquired the Valve Division, Lombard Governor Corp., Ashland, Mass., and will continue production of the latter company's line of valves.

CORRECTION

Due to a typographical error the name of the Selas Corp. of America, Philadelphia, was given as the Sales Corp. of America in the advertisement of the Worcester Pressed Steel Co., Worcester, Mass., appearing in the Dec. 10, 1945, issue of STEEL.

Industry Voices Disapproval of Proposed Atomic Energy Measures

Spokesmen tell Senate committee proposed control legislation now under consideration would discourage private research. Oppose government monopoly in the manufacture and use of fissionable materials

WASHINGTON

UNLESS Congress enacts a more liberal law than now is envisioned, progress in the field of atomic energy will be retarded, the Senate Committee on Atomic Energy was told last week by representatives of industry.

Both the McMahon and May-Johnson bills would discourage private industry and private research workers from developing atomic know-how, the committee was told, and it was emphasized that the government should not take unto itself a monopoly in the manufacture of these materials.

Most representative of the witnesses for industry was George E. Folk, patent adviser of the National Association of Manufacturers.

"We recognize the necessity and desirability that the government regulate and police the production and use of fissionable materials," said Mr. Folk, "but it is not necessary or advantageous to institute a program for government control of the production, ownership and use of fissionable materials.

"We endorse the maintenance of free enterprise in the development and exploitation of atomic energy for industrial purposes. We take the position that the proposed Atomic Energy Commission should be given only such authority as is, or may become, conducive to public health, with the least possible government interference."

"Source Materials" Ill-defined

Mr. Folk criticized the McMahon bill's definition of the term "source materials" as being too broad. There now are in existence many industries utilizing uranium, thorium and beryllium which would come under the control of the commission as the bill now stands. For example, the beryllium industry probably would come under control. Control also might extend, said Mr. Folk, to include "electrical apparatus, electromagnetic devices, blowers, turbines for generating power, fuels, etc."

Mr. Folk objected also that the McMahon bill defines atomic energy as including "all forms of energy liberated in the artificial transmutation of atomic species." This makes no allowance, he pointed out, for spontaneous transmutation such as occurs with radium. It is probable, he believed, that similar transmutation can also occur with many other elements without danger to the public in general.

Senator McMahon asked whether some sudden and widespread use of atomic energy might prove a dangerous shock to the economy. Mr. Folk said that, in the event of such a new development, he foresaw no more of a shock than from any other new development. He pointed out that the S. 1717 contemplates that licenses would be required covering research and use of fissionable materials, and this provision would deter development of harmless fissionable materials; he did not want any provisions that would prevent free people from searching for those materials in the ground and developing them.

Objects to Patent Provision

Strong objection was voiced by Mr. Folk to the provision under which patents covering inventions for the production, refining and other processing of fissionable materials would be issued to the commission and not to the inventor. He joined with the committee in feeling that discoveries developed in the work of the Manhattan Project, on which the taxpayers of the country spent about $2.5 billion, should be made freely available under non-exclusive, royalty-free licenses.

In conclusion, Mr. Folk warned there is danger of overlapping of activities and responsibilities of the proposed Atomic Energy Commission, as proposed in the McMahon (S. 1717) and the May-Johnson (H. R. 4280 and 4566 and S. 1463) bills, and the National Science Foundation, as proposed in the Kilgore (S. 1297) and Magnuson (S. 1285) bills.

Edwin D. Bransome, president, Vanadium Corp. of America, and Frederick Kett, general manager of that corporation's Mining Division, recommended a program of importing and stockpiling pitchblende or uranium concentrates from abroad, and the adoption of a policy of encouraging intensive prospecting and development of carnotite and roscoelite ores in the United States. These are uranium-bearing vanadium ores found in our western states.

Mr. Bransome did not want any restrictions that would hamper the research and development department of his company from working on new uses of uranium and other elements. He recommended that the law permit private companies, under proper control, to manufacture fissionable materials, instead of giving the government the monopoly in this field.

Under questioning, Mr. Bransome felt there was no likelihood that atomic energy is going to be developed in a week "to run an automobile or anything."

J. A. Rafferty, vice president, Union Carbide & Carbon Corp., unable to testify in detail because of restrictions still imposed on contractors, said new methods and techniques were developed "that will bring about industrial improvements in this country when the whole thing can be released." Much of the time Mr. Rafferty spent with the committee had to do with the makeup of the proposed Atomic Energy Commission. The most important point, he said, is that such power as is given by the law should be placed in the hands of industrial and scientific men who have been through the whole Manhattan Project.

Capt. R. A. Lavendar told the committee that the government has filed patent applications on discoveries that led to the atom bomb, but said the applications were written in skeleton outline so as not to disclose secrets. This action was taken to provide a legal peg on which the government can protect future claims to patent rights on processes.

MEETINGS....

Feb. 25-Mar. 1, American Society for Testing Materials: Spring meeting, Pittsburgh. C. L. Warwick, 260 South Broad St., Philadelphia 2, is secretary.

Feb. 25-Mar. 2, Twentieth Exposition of Chemical Industries: Grand Central Palace, New York.

Mar. 4, Society of Automotive Engineers: German engineering evaluation meeting, Rackham Educational Memorial, Detroit. John A. C. Warner, 29 West 39th St., New York 18, is secretary and general manager.

Mar. 5-6, Quality Controls Societies and Chicago Association of Commerce: Midwest quality control conference, La Salle Hotel, Chicago. W. E. Jones, 901 Argyle St., Chicago, is chairman.

Mar. 20-22, Chicago Technical Societies Council: Production Show, Stevens Hotel. Paul A. Jenkins, 53 W. Jackson Blvd., Chicago 4, is executive secretary.

Mar. 28-29, American Gas Association: Conference on industrial and commercial gas, Commodore Perry Hotel, Toledo, O. Harry A. Sutton, chairman.

Standby Tool Processing Under Army Ordnance Plan Progressing

Some 6500 tools of the more than 10,000 earmarked for storage already processed. Only one phase of Army's program to be prepared for production of ordnance in event of another emergency

OF SOME 10,000 machine tools earmarked by the Ordnance Department last year to be placed in storage for "the next war," some 6500 already have been processed. All are special-purpose tools or standard tools with highly special tooling.

The procedure involves taking each tool down, cleaning the parts and covering them with grease or plastic protective coatings, assembling all the components in one package which is done up in waterproof paper, and placing the complete unit on a skid for easy handling. The operation is a costly one; an outlay of $300 to $400 is required for each tool placed in storage.

Storage of tools is only one phase of the Ordnance Department's program to be prepared for the production of ordnance should another emergency develop. Another phase involves modernization of machine tools and other production equipment at various arsenals.

Arsenals Better Equipped Now

Prior to World War II the arsenals did not have all the equipment the Ordnance Department desired, and many of the tools in use at these establishments were over-age. This was a condition made necessary under the slim appropriations voted by Congress for military defense prior to the war. Since V-E and V-J Days the Ordnance Department has corrected this condition as war contracts have been terminated and production equipment become idle. A great deal of such equipment has been moved into arsenals. While all the prewar deficiencies have not yet been corrected, Ordnance Department spokesmen say that the arsenals now are in better shape than ever before in history to preserve the "know-how" of ordnance production, to develop new and improved techniques, and to serve as nuclei for any future mobilization of industry for purposes of war.

Another phase of the Ordnance Department's program to be prepared for production of ordnance at any time in the future takes the form of stipulations in lease agreements with private business interests that the plants involved will be maintained in good standby condition so they can be reverted to war production if the need arises. Under such leases the lessees may make no plant changes without approval. In some cases the lease agreements provide for safe storage of certain equipment in case the lessees have no immediate use for it in producing for the civilian economy. Stipulations of this kind, it is expected, will be included in a good many sales or lease agreements still to be made. Of late, the Ordnance Department has liberalized its policy in regard to special-purpose tools earmarked for storage; where such a tool is needed to speed reconversion of war plants to civilian production it is ready to release the tool to private industry. It has released a good many tools for reconversion use, even when their release has meant the breaking up of standby war production lines. As an example, the department a few days ago released two multislide presses to a private manufacturer who urgently needed them. This policy has two reasons. One is that it helps toward the administration's goal of speeding the reconversion of industry. The other is that new types of ordnance have been developed or are under development, so that there is no means of knowing positively which special-purpose tools will be needed for ordnance production in the future.

Predicts Wide Use of Rockets

That the ordnance picture is in a state of flux recently was indicated by Lt. Gen. Levin H. Campbell Jr. at his last press conference as Chief of Army Ordnance, on the eve of resigning this post to go with the International Harvester Co. He talked particularly about rockets; their possibility for war purposes are "infinite" and he predicted that the rocket would displace conventional artillery of today. There is no practical limitation on their range, he said, and he predicted that it will be possible in the near future to guide rockets accurately to any target on the globe. He foresaw wide use of guns for the purpose of launching rockets into the air, the rockets proceeding on their own power to destination after this initial impetus.

Radio-guided projectiles offer wide possibilities, said General Campbell. "We are bouncing radar beams off the moon," he said. "We can guide space ships by the same means."

LT. GEN. LEVIN H. CAMPBELL

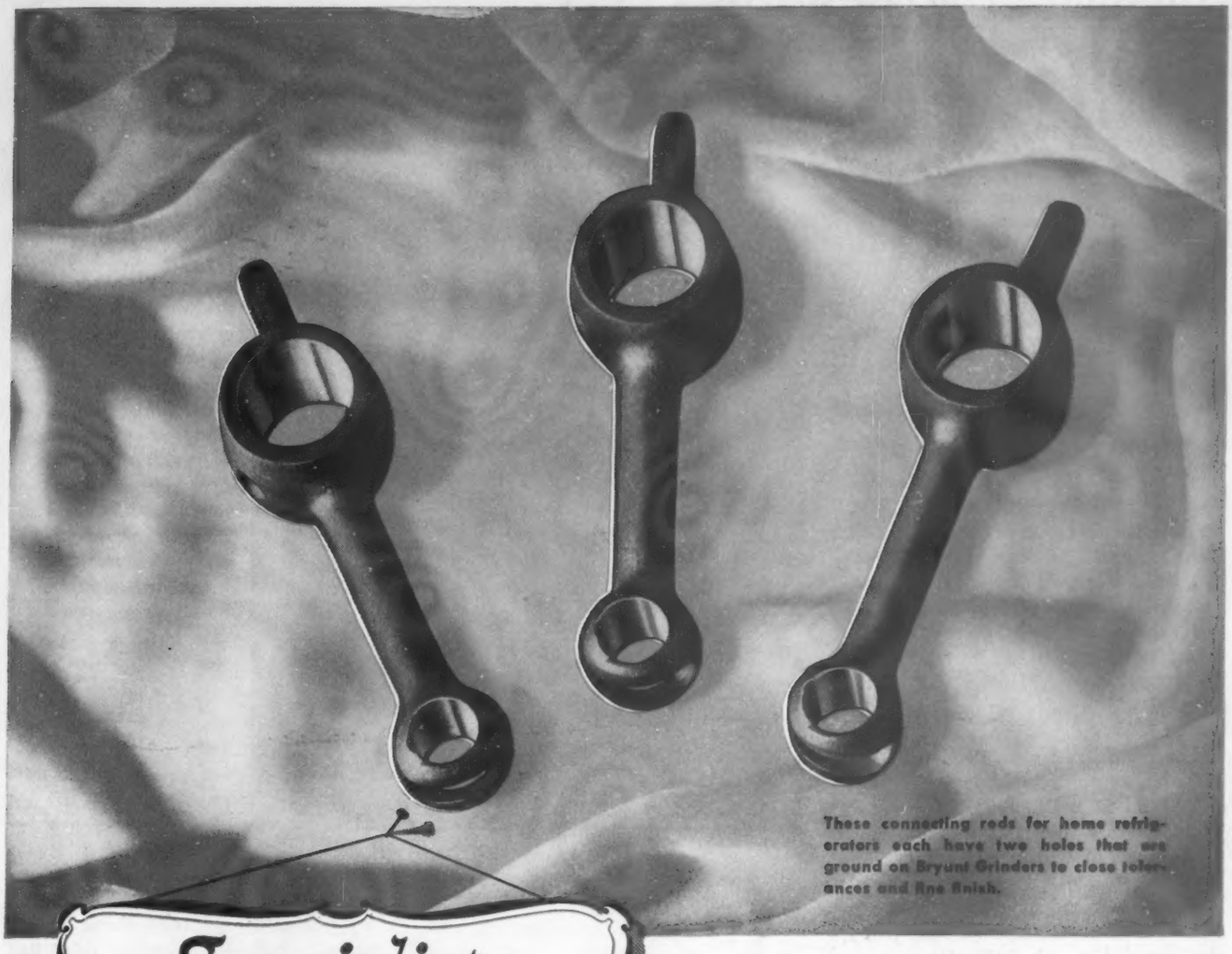
Formerly Chief of Ordnance, General Campbell has retired from the Army and accepted a vice presidency with International Harvester Co., Chicago

Numerous changes during the past war led to changes in equipment setups during the war. For instance, the conventional recoil mechanism was eliminated from countless guns manufactured for short-range firing.

In addition to storing equipment, the Ordnance Department also has plans for the storage of large quantities of ordnance. Just what arms are to be stored is still secret, but the plan is to have material in readiness to arm an army of several million men as rapidly as the men can be mobilized. General Campbell did reveal, however, that plans for such storage are in an advanced stage. Extensive use would be made of containers with silica gel as a dehumidifying agent to protect steel against rusting. The Army, said General Campbell, has many types of containers that would be suitable for such storage purposes. For large guns and tanks it has many oil storage tanks some of which have capacity of 50,000 barrels. He also said that much of our excess stock of aluminum sheet could be used to build "houses" over guns and gun carriages and tanks.

General Hughes Nominated As Chief of Ordnance

Maj. Gen. Everett S. Hughes has been nominated by President Truman to suc-



These connecting rods for home refrigerators each have two holes that are ground on Bryant Grinders to close tolerances and fine finish.

Specialists in Forged Steel Jewelry

No, we don't sell it; we don't make it, but we do build internal grinding machines that make it. The three connecting rods for home refrigerators, shown above, are typical examples of the type of work that is ground on Bryant Internal Grinders. They are truly jewel-like in their finish, but that is not enough—to be sure, Bryant Grinders produce metal parts that have surfaces finished correctly to millionths of an inch, when desired, but Bryant machines also produce these same parts with holes that are truly round and straight. These are basic elements that Bryant insists upon to assure Bryant users that their parts and products will last for years without mechanical failure.

WE KNOW YOUR PROBLEM IS DIFFERENT . . .

. . . practically every internal grinding problem is different. But when you require extreme accuracy or high production, *or both,* your first step should be to study your problem with a man who makes it his business to solve them. Your first step should be to—

Send for the Man from Bryant!

BRYANT

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

ceed Lt. Gen. Levin H. Campbell Jr. as chief of ordnance. General Campbell retired Feb. 13.

General Hughes, recently returned from Europe, was nominated for a four-year term and will retain his rank of major general. Also nominated by the President as assistants to the chief of ordnance were Maj. Gen. Gladeon M. Barnes and Maj. Gen. Henry B. Sayler, who will serve for the four-year term but will rank as brigadier generals.

Pricing Procedure for Used Machine Tools Revised

Ceiling prices for used machine tools have been restored to the same basis that was in effect prior to Dec. 17 (STEEL, Feb. 11, p. 66). Ceiling prices are now as follows: For used machine tools manufactured on or since Jan. 1, 1936, 95 per cent of the price of the machine when new, if sold on a rebuilt and guaranteed basis; 70 per cent of the price, if sold in any other condition, such as "as is."

For rebuilt and guaranteed used machine tools manufactured between Jan. 1, 1930, and Dec. 31, 1935, 90 per cent of the price of the machine when new; 65 per cent if sold in any other condition.

For rebuilt and guaranteed used machine tools manufactured between Jan. 1, 1920, and Dec. 31, 1929, 80 per cent of the price of the machine when new; 55 per cent if sold in any other condition.

For rebuilt and guaranteed used machine tools manufactured before Jan. 1, 1920, 70 per cent of the price when new; 45 per cent if sold in any other condition.

OPA Lifts Price Controls On 30 Nonferrous Metals

The Office of Price Administration recently announced suspension of price controls on a long list of commodities, including a number of nonferrous metals and ship and boat fittings, repairing, reconstruction and maintenance. The action became effective Feb. 13.

Items upon which price control is suspended are: Alumina, baddeleyite, barium, beryllium metal, alloys and oxide, bronze powder, cerium, columbium and ferrocolumbium, callium, germanium, gold bullion, gold leaf, semifabricated gold other than dental gold, and rolled gold on base metal other than silver, illinium, indium, lanthanum, lithium metal and lithium compounds other than salts, masurium, mesothorium, monazite, neodymium, praseodymium, radium, rhenium, samarium, selenium, tantalum, tellurium, thallium, thorium, titanium metal and alloys, zircon, and zirconium metal, oxide, alloys and compounds.

CONFIRMED: George E. Allen, personal adviser to President Truman, won confirmation as a director of the Reconstruction Finance Corp. after a lively debate in Senate Banking Committee hearings. Mr. Allen is a director of numerous corporations, including Republic Steel Corp. and Consolidated Vultee Aircraft Corp.

SPA's Stocks of Surplus Steel Products Mount

Steel products constitute the largest group of surplus production materials in the hands of the Surplus Property Administration, that agency reported to Congress last week, covering the final quarter of 1945.

Inventory on hand mounted from $29 million at the end of the third quarter, to $111 million by the end of December, Congress was informed. Fourth quarter sales were termed "disappointing," totaling only $11 million.

A Re-Usable Steel Products Advisory Committee was organized from the industry, and hope was expressed that this step would expedite movement of the surplus products through distributors' channels.

Supreme Court Hearings Held on Closed Shop Act

Recent hearings have been held by the Supreme Court to determine the legality of an anti-closed-shop law which was adopted in Florida after a state-wide referendum. The amendment provides that no person shall be denied the right to work by reason of membership or nonmembership in a labor union.

Taken to the Supreme Court after a three-judge district court had ruled that it was valid, the amendment is under dispute by fifty-four American Federation of Labor unions who, through A. F. of L. Attorney Herbert S. Thatcher, protest the act is an attempt "to destroy unions" by encouraging Florida employers to refuse to enter into closed-shop agreements or, in one case, to break a contract calling for a union shop.

Magnet Wire Inventory Limit Cut to 45 Days

Allowable inventory of magnet wire in the hands of consumers has been reduced from 60 to 45 days, or a practicable working inventory, whichever is less, the Civilian Production Administration ruled recently.

Arnold Appointed To Head Office of Small Business

Appointment of Laurence F. Arnold, Newton, Ill., as acting director, Office of Small Business, was announced by Secretary of Commerce Wallace recently. Mr. Arnold has been acting executive head of the Smaller War Plants Corp., most of which has recently been transferred to the Department of Commerce.

Large, Healthy Steel Industry Seen Needed For National Security

Consensus at Army Industrial College seminar is that present capacity should be retained intact. Educational orders or similar procedure considered by armed services to develop necessary techniques. Iron ore beneficiation studied

BRIG. GEN. DONALD ARMSTRONG

THE United States iron and steel industry should be prepared to meet all future military requirements if it does certain things. These may be considered under two main heads:

First, it must keep intact most of the existing iron and steelmaking facilities so that ingot capacity will continue to be maintained in the neighborhood of 95 million net tons. Second, the industry will have to solve a number of problems in order to meet peacetime needs; if these problems are solved—as they must be if the industry is to stay alive—it automatically should be ready to perform adequately in any future national emergency. In cases where production for civilian needs fails to keep alive certain techniques needed to supply military needs, the armed services will have to develop a procedure—probably by placing educational orders—to fill the gap.

But there is no means at present for determining the exact needs for steel in the next war. For example, many guns for short-range firing were used in World War II without the customary recoil mechanisms. Limited experience demonstrated that a small quantity of material in an atomic bomb wreaked destruction more than equal to that brought about by firing thousands of tons of steel projectiles into a given area. In fact, ordnance experts predict that the conventional artillery of today is likely to be made obsolete in the near future by the rapid development of rockets; following recent success in bouncing radar beams off the moon they are confident that it soon will be possible to guide space ships by the same means, and to direct rockets accurately to any spot on the surface of the globe.

In other words, military technique is undergoing rapid development, with the possibility of revolutionary c h a n g e s. Hence, there is no exact way of drawing specifications as to quantities and kinds of steel that might be required in another war, whether it were to be started in one year or 20 years. The entire steel picture, therefore, to keep the industry available for immediate future military mobilization, will have to be re-examined from time to time —possibly at intervals of six to 12 months.

These were the principal conclusions reached in a seminar recently held by the Army Industrial College with representatives of the iron and steel industry. Presided over by Brig. Gen. Donald Armstrong, Commandant of the College, the session was attended by Col. Robert W. Brown, USA, and Capt. E. R. Henning, USN, assistant commandants of the college. Others present included Col. Walter H. E. Jaeger, USA, director of the department of research of the college, and Capt. J. M. Worthington, USN, director of the department of instruction.

Representatives of the industry were F. H. Fanning, American Rolling Mill Co., Middletown, O.; S. S. Marshall Jr., Jones & Laughlin Steel Corp., Pittsburgh; J. L. Mauthe, Youngstown Sheet & Tube Co., Youngstown, O.; J. H. McElhinney, Wheeling Steel Corp., Wheeling, W. Va.; Earle C. Smith, Republic Steel Corp., Cleveland; H. C. Smith, Great Lakes Steel Corp., Detroit; A. D. Shankland, Bethlehem Steel Co., Bethlehem, Pa.; R. E. Zimmerman, United States Steel Corp. of Delaware, and Walter S. Tower, president, American Iron & Steel Institute.

Also present were representatives of the armed services, the Bureau of Mines, the Department of Commerce and the Senate Military Affairs Committee.

Proceedings throughout were of an informal character, and the stress was not so much on obtaining specific answers to questions as on uncovering the problems and indicating in a general way the approach to their solutions.

For example, opinion was advanced that some small plants which were used during the war are obsolete and will be out of business before very long. "But the plants that are in shape to make steel, all the good plants, can be put back into shape if you want to use them. You probably could have them in operating shape before you could cut all the red tape and get the paper work done to place the orders. There are many things to be improved, not only the quality but the production, but if you had another emergency and a fast one, there would be very little trouble getting production up as high as before . . . My guess is that probably 95 per cent of existing capacity is of fairly high efficiency."

Iron ore was shown to represent a problem largely for the industry. "This country has loads of iron ore but not of high-grade types. There are plenty of mines, and large ones, containing lower-grade ores, and there is development work going on." At the present rate of removal the reserves of high-grade ores will have been depleted within nine or ten years. The steel industry is giving consideration to conservation of high-grade ores, but probably will be forced to continue consuming them at the present rate for a number of compelling rea-

sons, it has been pointed out.

One is the state and local tax situation. "It is simply that the tax on high-grade ore makes it desirable to get it out of the ground, and I would say that any company with high-grade ore would get it out of the ground as fast as it could, unless that tax situation is taken care of. The tax bill on the ore and the sites is a rather sizable chunk of money."

Another reason is the competitive angle. A company conserving its reserves of high-grade ore and using expensive material would be at a competitive disadvantage with companies basing their costs on low-cost high-grade ores.

Another reason is that much more progress must be made in the development of methods of utilizing various low-grade ores.

Upgrading of iron ore from 30 per cent to 42 per cent, or possibly to 45 per cent, at the Hermann Goering Works was cited as nothing unusual. "If the American industry had to depend on the low-grade deposits at the present time, it would immediately install equipment to do at least that much with methods now known, even though that would cost a lot of money. But the industry is working still further, with the idea of bringing that material up, not to 45 per cent, but to 55 per cent. Indications are that it will be successful . . . In the meantime all of the ore that is used by northern and eastern furnaces that is not directly shipped from the Mesabi range gets quite a bit of beneficiation . . . New York state magnetite ore concentrates easily, and produces material of 60 to 70 per cent iron content which will meet competition as far as Pittsburgh."

Progress Is Offset

But, it was pointed out, there is an offset to that progress.

"Some of the steel companies that are working in the southern districts of the country probably could not stand the cost of receiving iron ore which beneficiated would bring 50 to 55 per cent iron. They are working on ores that may occasionally run up to 37 or 38 per cent. But they are usually tied somewhere around 33 per cent. Of course, they have some special conditions there that help insofar as costs are concerned. But from the metallurgical standpoint, because you are used to smelting lean ores doesn't mean that you can't become accustomed to making iron with beneficiated ores that run considerably higher. The chances are that we can come to somewhere near getting our money back by running on a higher grade product. That is the idea of picking up part of higher cost in the performance of the blast furnace due to ore beneficiation."

Beneficiation of southern ores was described as "a very difficut job and a slow one. There are beneficiating jobs there that have been on for years and are not going yet. One large company is shipping ore into Alabama right now because of this situation. With the Alabama ores we have a difficult problem to move them from where they are to where they are needed."

Maintaining of steel ingot capacity at present levels was recommended at a recent seminar of the Army Industrial College in the interest of national security. This raises the question of what is to be done with government-owned steel plants, such as the Geneva, Utah, plant, in the event it is not taken over by a private operator. A view of the open hearth department of the Geneva plant at the time steel production was started in 1944 is shown above

Another important factor in this situation is that of existing freight rates. "You will not have mines developed during peacetime with the present freight rates in effect—and this applies not only to Alabama but to many other districts."

Feeder Ore Is Problem

Another problem is the supply of lump or feeder ore for basic open-hearth furnace operation. Requirements were estimated at about one million tons annually and it is necessary to utilize magnetite concentrate to make up this amount. Of four dependable sources of supply in this country, only one is susceptible of much expansion of output. Desirability of developing techniques which would make use of feeder ore unnecessary was suggested but the idea was not regarded as practical for the present time.

Some thought was given to the prospects for importing iron ore—and Brazil, Mexico and Cuba were mentioned as potential future sources. For one thing, it was said, importations on a substantial scale would conserve our own reserves, but this would require formulation of a national policy. Competitive prices at present do not give foreign ore any commanding advantage, and it was pointed out that Lake Superior ores have been shipped to eastern blast furnaces in recent years. "I think a plant farther inland than Pittsburgh would be incapable of using imported ores." The probability of extensive importation of iron ore in coming years was admitted, but it will not be possible to make a worthwhile forecast of this movement until more is known about the cost of beneficiating our low-grade domestic ores.

Mention was made of a possible effort to obtain some preferential future tax treatment of the iron and steel industry to encourage it to undertake the large expenditures required to develop ore beneficiating methods and purchase the necessary equipment; it was thought such help might be justified on the ground that development of the use of low-grade ores would promote the national defense. But no decisions were made and this subject remains for future consideration. Mention also was made of the need to revise freight rates to encourage development of new ore mines and utilization of low-grade ores, but here again no immediate action was contemplated.

Reserves of coking coal were not re-

garded as an acute problem. "There is lots of coal but good coal is being used fast. The average coking coal is getting a little more ash and a little less sulphur all the time. The industry is struggling with that problem now. I personally do not think there is any reason to say we cannot make enough coke."

It was brought out in a colloquy on location of steelmaking facilities that steel now is made in 21 states, but that the concentration of the industry in the Pittsburgh and Chicago districts represents a serious defense problem for the future. These locations, it was pointed out, were selected for economic reasons which continue to rule. This condition makes it all the more essential to keep alive facilities, such as the Geneva plant, which are entirely outside the congested areas. Regret was expressed over discontinuance of the Defense Plant Corp.'s experiments on direct production of iron in small units; the results of such experiments, if pushed to a conclusion, might indicate how small iron producing units could be scattered about the country in a time of future emergency.

One of the problems of the armed services during the peacetime period ahead, it was brought out, is to keep the "art" alive on the one hand, and to keep it alive on a sufficiently large scale. For instance, at the start of World War II one or two companies were producing certain "tricky" alloy steels for the Navy; as the war progressed, other mills made them. One of the current needs is to have some production of jet engines and parts for jet engines. Some scheme, possibly involving the placing of educational orders from time to time, will have to be evolved to keep alive the know-how of production which has no important place in the civilian economy.

Civilian Needs Will Maintain Techniques

On the other hand, it was pointed out, civilian needs will serve to maintain many techniques and much equipment which originated in war requirements. For example, bomber noses were formed during the war by spinning rather than by presses. This process will be kept alive by being used in producing high-pressure gas cylinders.

Some attention was given to the subject of stockpiling of critical materials for future military use. Manganese ore, for example, is imported almost entirely in normal times. In general, there would be no need to stockpile materials obtained from sources in North America or immediately adjacent thereto. For other materials the value of stockpiling could be better judged if it were known how soon the stockpiled materials would start to be consumed, and how the next war would affect our sources of supply. Materials held critical today, it was pointed out, may be less critical in the future. For instance, molybdenum replaced tungsten to a large extent during World War II.

Stockpiling would present some dangers to the civilian economy. "If I had complete confidence in our ability to retain the stockpiles as stockpiles, I might feel a little differently about it. But the mere existence of a stockpile is a constant commercial threat. I do not think it is humanly possible under our system of government completely to divorce stockpiles from political football."

A proposal to embargo scrap iron and steel exports from the United States brought pro and con arguments from industry representatives. "We would have felt more comfortable if we had retained the scrap we shipped to Japan and Italy before the war and "the scrap we exported came to about 25 million tons, or about one and a half months' requirements of the industry during the war, and the export of that amount of scrap could not make or break the industry."

Stockpiling Not Favored

Prevailing opinion was that scrap does not lend itself to stockpiling, but alternate solutions differed. One view was that we should have more blast furnaces in relation to open-hearth furnaces: "I would rather see an ore reserve and a blast furnace reserve than to see a scrap reserve." Another view was: "The minute you get into a war emergency you have to change your whole balance. You will not have the amount of scrap you normally get for your operation. So you must build more blast furnaces and buy more ore in order to get a balance. Therefore, you must have an embargo on scrap if we are not going to get into the position we were in in this last war." Still another view was that the United States could go through another emergency without any scrap at all: "You can't run the whole steel industry that way but you could make 60,000,000 tons of ingots—we might suffer as civilians, but the Army and Navy would not run short of steel."

Consensus was that about 55 man-hours of labor have to be expended on a ton of finished steel, on the average, before it can be shipped—and it was estimated that a ton of scrap saves 10 to 12 of these man-hours. But this discussion got nowhere; for instance, it was pointed out that far more man-hours than are saved by using scrap are necessary to get out the limestone to make iron from ore.

It also was estimated that labor shortages did not cause any disastrous reduction in steel output during the war. "If you want a concrete estimate of all the steel you might have had if all the labor the industry could have handled had been available, you could figure on probaby 4,000,000 to 5,000,000 tons a year more. If you had had that 4,000,000 or 5,000,000 tons more I don't know that you would have been able to figure out any useful purposes to which you could devote them."

Prevailing opinion about battle scrap was that its use would be uneconomical.

Discussion brought out the success of alloy conservation during the war. "One of the lessons we learned was that through the segregation of our scrap we recovered more alloys from scrap than we saved as virgin alloys." . . .

"We learned a lot in the business of heat-treating steels instead of using alloys. I think that lesson will go on. We can conserve alloys by using steel plate that has been heat-treated. I think we will get to a point where we will use heat-treating of steel to get these physical properties that we want instead of dumping high-priced alloys in willy-nilly."

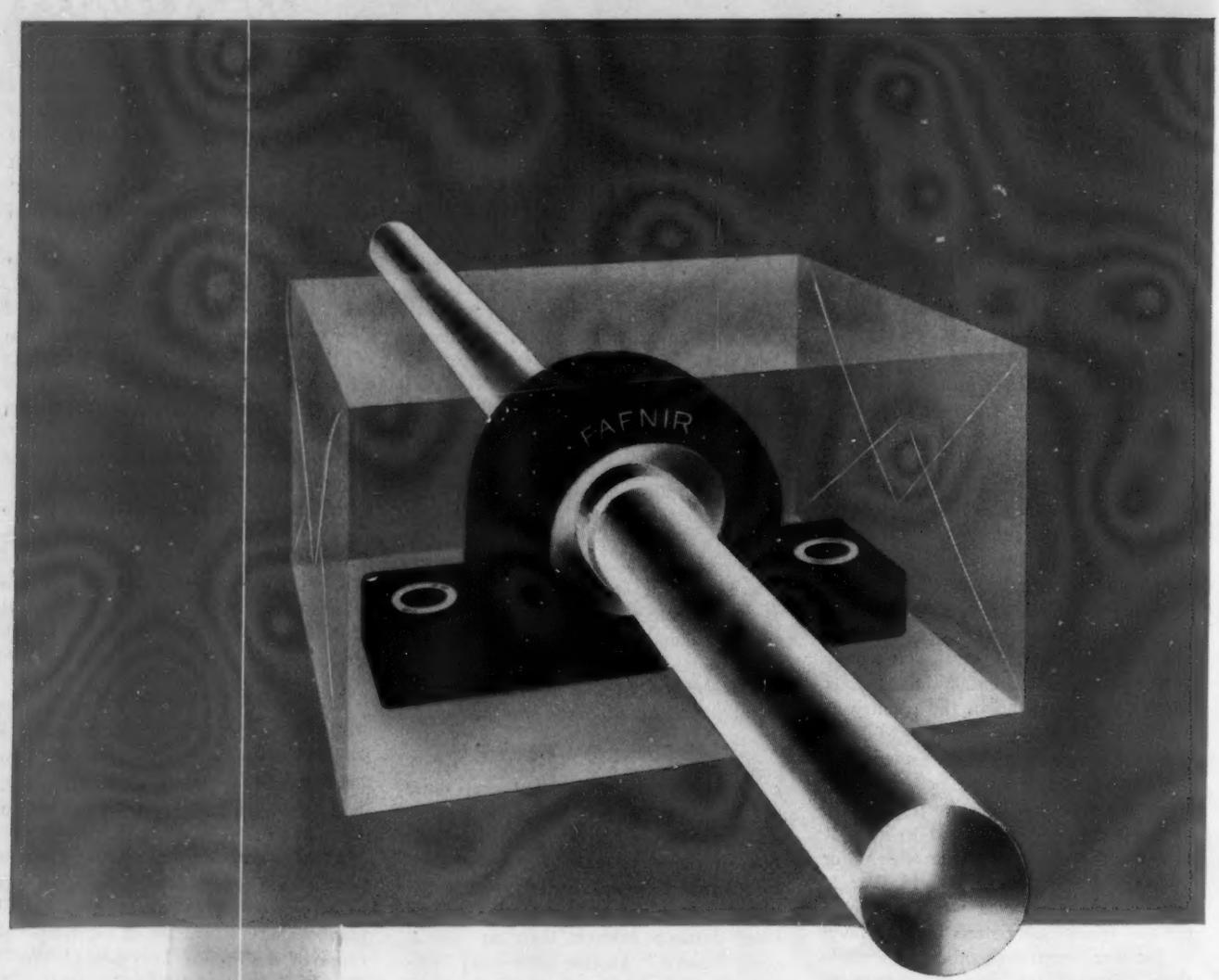
CMP Commended

The Controlled Materials Plan came in for hearty commendation. "The CMP, in the event of another M-Day, should be placed in operation right from the outset."

Stress was placed on the importance of deciding, long before another war hits us, what men are indispensable in a steel plant. There was a lot of hardship because of drafting of key men in World War II. "A lot of talent was overtaxed, the talent that is dropping off with bad hearts and premature greying and various other things attendant upon excessive fatigue. This situation did not show up much in the tonnage produced, but if the war had been prolonged a little longer we would really have felt the effect. We were just getting into difficulties.

"As a result we anticipate about a three-year gap in our oncoming supply of qualified technical men. The extent of the gap is going to depend upon how much steel the industry is asked to produce. That is, whether all of the plants have to have a full quota of men to take care of the positions that exist there. To a degree, the overburdened load is still continuing on the technical men that remain.

"This situation is made worse by the fact that under our present labor setup it is difficult to train technical men. This used to be accomplished by putting them into a production unit and moving them along. So the five or six-year period it took before the new technologists were really able to taken on a fairly sizable job, is going to lengthen. We cannot move them up through the ranks as we used to."



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MOST COMPLETE LINE IN AMERICA

FAFNIR BALL BEARINGS

mirrors of MOTORDOM

By A. H. ALLEN *Detroit Editor, STEEL*

Ford figures show manufacturing costs on two-door sedan up $450 since 1941. Net loss under present OPA ceilings is $313. Price ceilings, labor trouble and increased labor costs make obtaining of parts from suppliers exceedingly difficult

DETROIT

WITH disarming frankness never a characteristic of earlier Ford executives, Henry Ford II recently sketched the automotive picture of the moment for a San Francisco audience, and his remarks would be applauded to the echo by practically every manufacturer in the country. Essence of his comment was that the Ford company is launched on the biggest gamble of its history — a gamble on the American people and the future of the free enterprise system in this country.

The reason for the gamble is simply that it is impossible to manufacture profitably under today's wage-price limitations, but Ford is determined to proceed at a loss in the hope some way can be found out of the tangle. A few figures on costs tell the story graphically and Mr. Ford recited them in detail. The following comparisons of manufacturing costs deal with a two-door sedan:

	1941 Model	1942 Model	1946 Model
Material costs	$304	$343	$456
Labor costs	$ 76	$124	$152
Man-hours	87	102	128
Overhead	$132	$225	$354
Total manufacturing cost	$512	$692	$962

These are staggering increases and reflect the alarming drop in individual productivity, even between the 1941 and 1942 models. The costs on 1946 models may be tempered somewhat as volume increases, but the figures shown are based on production of the first 30,000 Ford passenger cars. The sharp increases in overhead include the cost of plant maintenance during work stoppages, wildcat strikes, etc.

Consider Ford's predicament now, with a manufacturing cost of $962, to which must be added costs of sales and distribution, making a total of $1041.26, allowing nothing at all for profit. Yet the OPA ceiling price on this model was set at $728—the price Ford is permitted to charge dealers. Here is a net deficit of $313 on costs alone, giving no consideration to profit or reserves for future plant requirements.

Turning to the problems of suppliers and vendors, Mr. Ford prefaced his observations by noting that "There are some days on which the mailman brings us more from our suppliers than the railroads do." He classified suppliers' troubles in three groups — strikes and work stoppages, inability to obtain labor at a reasonable price, and limitations of price ceilings. Probably most suppliers are belabored by all three, in varying degrees, but the net result has been that parts shipments to Ford have been seriously delayed and far below specified volume. Some vendors, confronted with producing at a loss under price ceilings, have cut back their volume deliberately in the hope of holding total loss at a minimum pending a solution of the difficulty. Others have simply switched over to some other product or line where there is no price ceiling problem. Mr. Ford cited the case of a gray iron foundry source which recently shipped back patterns to Ford with the comment that after experiencing a loss of $330,000 in 1945 because of price ceilings it was decided to abandon castings production.

Some of the ridiculous aspects of price ceilings as a means of "holding the line" against inflation are well known to business men, and Mr. Ford detailed a typical example. A supplier had been making thousands of small but vital truck parts priced at 50 cents each. He was confronted with higher material costs and after V-J Day asked OPA approval of a price of 61 cents on the part. The agency refused the increase and said it would allow 54 cents but no more. The supplier could not produce at this figure and therefore discontinued production of the part. Ford immediately had to look for a new source and finally found two. One is now furnishing the part at a price of 82 cents, the second, 85 cents, both with full OPA approval, because the suppliers never produced this part before.

So here we have Ford paying 68 per cent more for the identical part than originally, and 38 per cent more than the first source would have charged if he had not been put out of business by price ceilings. Furthermore the two current suppliers must be enjoying a handsome profit, while the OPA smugly sits back and thinks it is restraining inflation whereas actually it is encouraging it on the above basis. Price control of this sort is nothing more than production and profit control, both foreign to time-tested business principles in this country.

Mr. Ford made it clear in his comment

WINGED AUTO: Southern Aircraft Corp.'s experimental airplane with an automobile chassis, called the "Rodable," is shown in flight at Majors Field, Texas, during tests. Propeller and tail section can be removed, leaving a conventional auto for highway use. NEA photo

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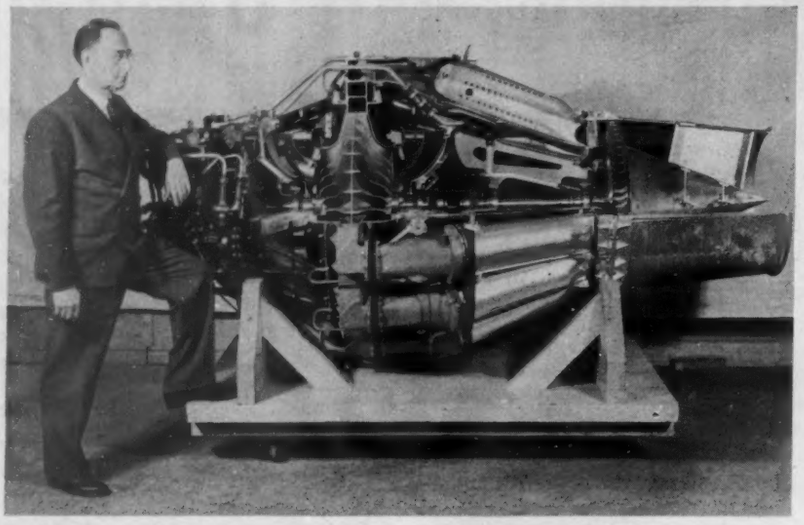

RECORD-BREAKER: Cutaway of a General Electric jet engine of the 1-40 type, which recently drove a Lockheed Shooting Star on a California-New York speed record of 4 hours and 13 minutes, is inspected by R. G. Standerwick, engineer who supervised its design and development. On the record-breaking flight, the plane averaged 584 miles an hour, attained top speed of 660 miles an hour

that his company does not seek to condemn government policy but simply wishes to point out what the real situation is. As to what to do about it, here are Mr. Ford's own words: "The decision which we made was to take a very big gamble. We decided that we should do everything in the world that we could to produce automobiles. It seemed to us that the greatest contribution we could make as citizens of a great country would be to get the assembly lines moving to get out the cars, to help meet the national threat of inflation which exists in free money that wants to buy but cannot find the things to buy which people want and need.

"Ford has taken all of its war earnings and is plowing them back into the business. Every penny has been committed to the improvement and expansion of the plant, machinery and facilities for the comfort and convenience of employees. Here again we are putting our bets on the future — on going ahead — on getting greater production and, what is just as important, greater productivity.

"In the second place, we are assuming that the price ceiling problem will be solved. How big a gamble this is, we do not really know. In summary, we may lose very substantially in 1946, but we will be on the way."

Continuing delays in getting assemblies of 1946 model passenger cars under way and the likelihood that it may be several weeks more before output comes anywhere near normal, have led some of the industry crystal-gazers to the forecast that there will be no 1947 models introduced this fall and assemblies of current models will be continued on through to next year some time. While such speculation may sound logical on the surface, it is not based on much solid fact, since 1947 model programs have already been started, and tooling is in the early stages. It is not likely this work, even though a little behind schedule, will be called off entirely. A better possibility is that the 1946 model schedules will be trimmed sharply so they can be run out this summer and the 1947 series launched in the fall.

Speculation also has been heard to the effect the industry might abandon its policy of a complete model changeover in favor of making improvement gradually as they come from month to month, so that assembly lines could be kept moving without interruption other than to assimilate a succession of minor changes. The trouble with such a plan is that it would keep manufacturing tempo continually unsettled and also would create serious merchandising problems because constantly changing models could not be identified readily by a yearly designation.

The Tucker Torpedo, radically styled passenger car designed by Preston Tucker of Ypsilanti, Mich., appeared a step closer to realization following the announcement of a number of prominent automotive executives who are going to be associated with the designer in the project. They include Ray Rausch, former manufacturing chief at Ford; H. F. Costello, formerly with Easy Washing Machine Co., who will be sales manager of the new venture; J. D. Burke, formerly with Packard, Hudson, Graham-Paige, Dodge and Chrysler, who will be vice president in charge of sales; Eugene L. Reason, former purchasing official at Chrysler and later with Steel Sales Corp., who will be vice president in charge of purchasing; J. H. Bush, former Ford branch plant superintendent, who will be superintendent; George S. Lawson, formerly with General Motors, who will be director of style, art and color.

As yet, the Tucker Torpedo is on paper only, but negotiations are reportedly under way with the RFC for aquisition of manufacturing facilities in the former Dodge Chicago Aircraft engine plant. Backers of the project are not disclosed as yet, but are said to include a number of wealthy Chicago financial interests.

The car itself is a rear-engine type, with 6-cylinder 150-horsepower power plant of unconventional design. Body is radically streamlined and features front fender and headlight assemblies that turn with the wheels. Originally proposed with a central steering wheel, this has been modified to a left-hand drive because of legal restrictions in some states. Speed of 130 miles an hour is claimed.

Prediction Is Questioned

Ray Rausch is of course no slouch at supervising a manufacturing program, and is quoted as saying he can have the car in production in six months. Around Detroit he could get 100 to 1 odds against this. E. J. Hunt, another manufacturing genius and now directing operations for Kaiser-Frazer at Willow Run is having his share of troubles in gearing up for production and probably would give Mr. Rausch 200 to 1 odds on his optimistic statements. In steel circles here it is said Kaiser-Frazer dangled a 15,000-ton inquiry for sheets and strips in front of a number of steel companies who merely yawned and looked the other way.

Curbstone specialists around town are trying to read into the recent association of James Mooney, former General Motors overseas operations chief, with Willys-Overland as a possible behind-the-scenes move by GM toward acquiring the Toledo firm as a manufacturing center for the forthcoming Chevrolet light car. While the sudden switch by Mooney from GM to Willys was a surprising development, it is difficult to make much of a case for GM being interested in taking over the sprawling Toledo operations, in view of the GM policy of favoring the construction of entirely new plants in areas removed from metropolitan congestion.

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Bethlehem Steel Program Promotes Employees' Safety and Health

Efficiency increased and absenteeism reduced by prompt discovery and treatment of workers' ailments. Company maintains plant physicians, nurses, clinics and, at some plants, hospitals. Research in occupational diseases and their cure carried on

By LOYAL A. SHOUDY, M.D.
Medical Director
Bethlehem Steel Co.

Exterior view of a hospital on the premises of a Bethlehem Steel Co. plant

Injuries of employees are treated in this Bethlehem Steel Co. clinic by a corps of trained nurses and physicians

ONE of the major contributions of modern industry to the physical well-being of the nation is the widespread adoption of industrial medicine, health promotion and safety as practiced in the plants of leading corporations. The programs and practices adopted have been so successful that a citizen today is safer in a steel plant, for example, than he is on the highway or in his own home.

Reason for the superior health and safety conditions enjoyed by men and women at work is that industrial hazards and diseases are known, charted and kept under control. Medical men, engineers and plant designers address their respective skills to maintaining working conditions which promote the general health of the employee and keep occupational risks to a minimum. Progress which has been made in this direction has been due not only to the interest of industry in its social responsibilities, but also to an awareness of the waste and costliness of absenteeism, and to productiveness of the healthy individual as compared to one who is working with depleted energies, or interrupted by the handicaps of illness or injury.

Bethlehem Steel Co. was one of the first industrial concerns to establish a division of industrial medicine, and the scope of these operations has grown with the steadily increasing size of the organization. In 1944, the expenditures of the Medical Division for examinations, dispensaries, services of physicians and surgeons and for general preventive work totaled over $2,500,000.

Industrial medicine varies in its method of application among various companies. Some have an elaborate general plan which provides a standardized procedure used throughout the total company organization. Some establish their own modern hospitals in contrast to using the community facilities. Bethlehem Steel Co. embraces so many different types of activity in so many different communities that its program in many respects is flexible to meet local conditions.

The problems in a steel plant may be quite different, for example, than the requirements of a shipyard. The mines and quarries have their own peculiar problems. Fabricating shops present a third situation.

Another variant to be considered is the available hospital resources. In Baltimore, Lackawanna, N. Y., San Francisco, or in almost any list of communities which might be mentioned, there will be found differing conditions which will affect the necessary hospital program of the particular plant in the location.

Flexibility in adjusting to local conditions does not, of course, imply any relaxation from basic standards. At Bethlehem's general headquarters there is a Medical Department under the direction of the medical director, who has overall responsibility for the industrial medical activity of the company, whether at Boston, Corsicana, Tex., Seattle, or wherever. At each point there is a plant physician in charge. Each of these keeps the medical director regularly informed of plant conditions, current and future needs.

Plant Physicians Selected Carefully

The medical director passes upon the fitness of the plant physician in charge and this is regarded as one of the key points in the maintaining of standards and the rendering of effective service. The record of the physician in charge is thoroughly gone into not only from the standpoint of medical competence, but also as to personality and standing in the community. The success of industrial medicine in a plant or organization depends to a considerable degree upon the personality of the staff. The human factor is important not only in relationship to giving satisfactory service directly to the employees, but also in enlisting co-operation with the medical facilities of the community.

Personal visits to plants by the medical director are further means of maintaining efficiency in the plant medical divisions. Personal conferences giving opportunity for a detailed discussion of problems are obviously a necessary supplement to correspondence and reports from plant physicians.

Another activity of the Medical Department headquarters is that of research. Bethlehem has an industrial hygienist whose duty it is to study all phases of occupational diseases which may be related to the different types of production, and also to study and recommend means for their care or prevention. Research in this field is vast, being carried on by industry, universities and various governmental agencies. The task of the industrial hygienist is not only to contribute to industrial research but to be informed of significant and useful developments wherever they may originate.

The core of the Medical Department activity at any Bethlehem operation is the medical clinic, or dispensary. Here the newcomer is sent for his original physical examination before being employed and assigned to his job. Here he is welcomed and assisted whenever confronted with any illness or injury problem. Bethlehem has 10 such medical clinics at steel plants, 13 at shipyards, 6 at fabricating works, and similar facilities serving mines and quarries. Each dispensary is more than a bandage station. It is a health center. The size and equipment of each of these facilities depends upon the need. Some are equipped with beds, x-rays, physiotherapy, electrocardiograph and other diagnostic apparatus. All are prepared to render emergency first aid, and to furnish full care for all minor illnesses and injuries. Immediate treatment keeps injuries in a minor category.

In some instances, Bethlehem has operated fully equipped hospitals at its plant locations; but experience has led to the general practice of arranging for such facilities in co-operation with local hospitals. The latter plan has two advantages. If the plant attempts to form its own general hospital it is confronted

Complementing the safety and health educational program of Bethlehem Steel are mechanical safety devices for the protection of employees, such as the one illustrated. The punch press operator wears a harness that pulls his hands away from the machine when the punch is in motion, preventing accident to the hands

with the economic situation of peaks and valleys, being over-staffed and having surplus accommodations at one time, and being over-crowded at others. During over-crowded periods it is likely to find neighboring hospitals less able to help than where there has been a continuing relationship.

All hospitals have the difficulty of varying demands, but the demand which is averaged over an entire community is less fluctuating than if confined to a single plant operation.

Secondly, the pooling of the plant's hospital activities with the hospital facilities in the area is strengthening to the community's health program. The overhead is reduced, the revenue of local hospitals is increased, with a consequent improved ability to serve.

On the same principle, plant medical, surgical and nursing care by its own staff is generally confined to plant requirements. Where consultants are needed, they may be secured from the local hospital staff. It is the practice of the Medical Department to maintain a close contact with the family physician, as well as to work harmoniously with the various medical schools and hospitals.

It is believed that the type of policy pursued by Bethlehem, and by companies with similar methods, has had an influence in the rise of industrial medicine, and has eliminated the criticism directed toward it in earlier days. When the practice of having "a company doctor" came into general use a generation or so ago there were many objections. The attitude of some of the medical profession at first was that it was contrary to the high principles of the profession for a physician to "contract" his services. In areas where industry served a large part of the population it was feared that the general medical services of the community might be weakened through the competition of company medical service. Again, in some communities there was apprehension among employees lest their freedom of choice in medical service might be curtailed. Where a plant, however, has worked co-operatively rather than competitively with the local community the whole health program of the area has been strengthened.

How the industrial medicine program works for the individual employee is indicated by the following description of the procedure as outlined by a company physician referring to a particular plant.

"After an employee is hired by Bethlehem the conditions under which he works are watched over by the Medical Department. His superiors see to it that he reports at once to the clinic or a first aid station any cut, bruise, abrasion, etc. he may incur while at work.

"Similarly, if the employee goes to his foreman and says, 'I don't feel too good, boss,' he is promptly sent to the dispensary. There he is examined by a physician and if he is, as he thinks, ill, he is sent home with the admonition to see his personal physician.

All Factors Considered

"At this point, however, there arises a delicate demarcation of function, a question of decision for the company physician. His decision rests on the outcome of a searching inquiry into the nature of the work the man is doing, the conditions under which he is working, and his past medical history, the object being to determine if he should be given a physical check-up to diagnose any occupational-induced disease.

"If it is obvious that the man has, let us suppose, a common cold, an attack of grippe, or, perhaps, the measles, it's plainly a case for the family physician; if he appears to have an illness traceable to his work, it is equally plain that he is entitled to and should have the attention of the Medical Department.

"Let's take the case of the man who is told to go home and see his own doctor, first. He does so and after a given period returns to work. If he has been absent from his job longer than the stipulated time — the usual period is three days — he may not 'punch in' until he has seen the company physician.

"Now comes the other employee, the man believed to be suffering from a condition due to the nature of his work. He makes this fact known to the exam-

ining physician who proceeds to provide a thorough examination and to recommend the proper care.

"Suppose he is a laborer in the open hearth where he does heavy work. He says he has strained his back. A trained physiotherapist gives him the proper treatments right in the company dispensary, where modern equipment is provided; or at smaller plants where such specialized services are not available, the plant doctor sees that the employee is put in the hands of a qualified man for treatment."

Part of Company's Organization

The Medical Department, as the recital of the individual case indicates, is an integral part of both plant and company-wide organization. All activities are related to it in respect to health. Plant ventilation, the physical capacities of workers for specific jobs, the safe engineering of buildings and machinery, the protection of workers from heat, hot metal, or other industrial hazards are all related to the plant's health status.

Perhaps closest to the Medical Division, is the Division of Compensation and Safety. This division is concerned with the proper engineering of jobs and the training and education of the employees in respect to safe practices. Obviously, there is constant intercommunication with the Medical Department on various phases of this work.

Hundreds of employees are able and willing to stay at work, and do so, after reaching the time of being eligible for a pension, namely after 25 years of service and 65 years of age. For example, the average age of the regular pensioners at the time they were pensioned was 68.52 years. The cost of the pension plan is borne wholly by the company, and has the health value of moderating the universal problems of old age and financial status. A further feature of the pension plan is that it provides for the pensioning of employees having at least 15 years continuous service who become through some unavoidable cause totally incapacitated. Over $16 million has been paid out since the inauguration of the plan.

A further major contribution to employees and community health is the Bethlehem relief plan which provides for weekly disability payments, as well as death benefits.

The object of the relief plan is to provide, at a minimum cost, benefits for employees when they are disabled by sickness or accident for which they are not entitled by law to compensation or other payments from Bethlehem under workmen's compensation laws or otherwise, and to provide benefits in the case of death of participants.

The assurance of weekly payments in cases of illness or other disability helps to banish the specter of financial worry which can have a deleterious effect in many illness cases. Again, the existence of disability payments encourages the patient to seek medical aid promptly, thus halting many disabilities in their early stages.

More than 130,000 Bethlehem employees are participants in the relief plan. In recent years disbursements to members have totaled around $3 million per year. Since the inception of the plan on June 1, 1926, it has disbursed almost $30 million, of which slightly over half was in sickness benefits and the remainder was in death benefits as provided by the plan. The company assumes the entire cost of administering the plan. Contributions by participants supply its funds and all such contributions become available for distribution as benefits. The plan is controlled by a board of trustees evenly divided in representation between management and employee participants.

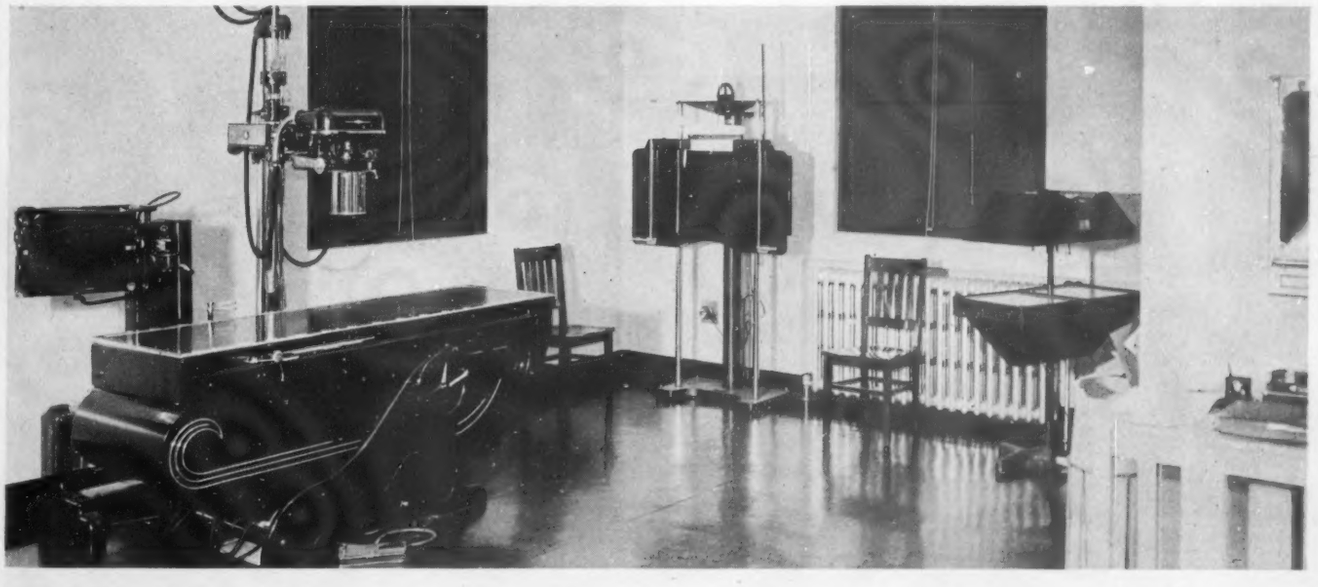
Structural Steel Shapes Recommendation Approved

A voluntary Simplified Practice Recommendation for structural steel shapes has been approved for promulgation, according to an announcement of the Division of Simplified Practice, National Bureau of Standards. Effective Feb. 15, 1946, and identified as R216-46, Hot-Rolled Carbon Steel Structural Shapes, the recommendation will be available in printed form early this month from the office of the Superintendent of Documents, Government Printing Office, Washington 25.

The recommendation, which had its beginning as a proposal of the Technical Committee on Carbon Steel Plate & Structural Shapes, American Iron & Steel Institute, is composed of 19 tables and covers the nominal sizes and weights per linear foot of wide-flange bearing piles, channels, and tees, with angles being shown in thickness. Sections and angles in carbuilding and shipbuilding are also included.

The declared purpose of the program is to eliminate avoidable waste through identification of those varieties of structural steel shapes that have the greatest usage. General adherence to the simplified list should result in tangible advantages to manufacturers, distributors and users, it is said.

Modern x-ray room and equipment in a Bethlehem plant hospital



MEN of industry

J. W. Patrick Jr. has been named manager of warehouses, Follansbee Steel Corp., Pittsburgh. For the past 15 years, Mr. Patrick has been associated with Peter A. Frasse Co. Inc., New York, and at the time of joining the Follansbee Steel Corp., was manager of the Frasse company's Philadelphia branch.

—o—

Norris J. Clarke, senior vice president, Republic Steel Corp., Cleveland, has been elected president of the Mid-America Exposition which is to be held in the Cleveland Public Auditorium May 23 to June 2. **Charles J. Stilwell,** president, Warner & Swasey Co., Cleveland, and **A. W. Steudel,** president, Sherwin-Williams Co., Cleveland, were named vice presidents.

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James A. Leahy, for 33 years associated with Joseph T. Ryerson & Son Inc., Chicago, in inside sales department development and activities, recently retired from service with the company.

—o—

George D. Behlen has become associated with the Bradford Machine Tool Co., Cincinnati, as head of its Electrical Tool Division. For the past 6 years, Mr. Behlen has been chief engineer and production manager, U. S. Electrical Tool Co., Cincinnati.

—o—

J. William Schulze, vice president, Bath Iron Works Corp., Bath, Me., has been elected a director.

—o—

Hans A. Eggerss has been elected executive vice president, Continental Can Co. Inc., New York. He is a director of the company and is president, Container Co., a subsidiary.

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George P. Torrence, president, and **John S. Clark,** vice president and treasurer, Cleveland Pneumatic Tool Co., Cleveland, have resigned.

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Louis J. Reed has been appointed assistant chief engineer, Jones & Laughlin Steel Corp., Pittsburgh. **R. W. Burton,** former assistant to the manager of the company's Detroit warehouse, has been appointed manager, Jones & Laughlin Steel Service Inc., New York. Mr. Burton succeeds the late **H. B. Royer.**

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William A. McCracken, former assistant works manager, Kellogg Switchboard & Supply Co., Chicago, has been appointed works manager to succeed James H. Kellogg, who recently was elected president.

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Alice D. Prigg has been appointed purchasing agent, Washington Steel Corp., Washington, Pa.

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Richard Shively, an employee for 42 years, Tennessee Coal, Iron & Railroad Co., Birmingham, and purchasing agent since 1936, retired Feb. 1. **Lavette C. Teague,** assistant purchasing agent, succeeds Mr. Shively. **Alfred J. Cox** and **James B. Noel** will be assistant purchasing agents and **Clarence E. Michaels** will be assistant to the purchasing agent.

—o—

Edward E. Helm, general sales manager, Reliance Electric & Engineering Co., Cleveland, has been elected sales vice president of the company.

—o—

W. G. Winslow has been appointed South American sales representative by Falk Corp., Milwaukee, Monitor Controller Co., Baltimore, Reliance Electric & Engineering Co., Cleveland, and Union Chain & Mfg. Co., Sandusky, O. Mr. Winslow will make his heaquarters in Sao Paulo, Brazil.

—o—

Robert L. Heath, manager of the St. Louis office, Climax Molybdenum Co., New York, will be in charge of the company's metallurgical service to the railroads.

—o—

J. Robert Kelley, who joined Manning, Maxwell & Moore Inc., Bridgeport, Conn., in 1930 as general manager, Mill Supply Division, and through succeeding advancements became assistant to the president in June, 1942, has been appointed executive vice president of the corporation.

—o—

Harry J. Ritterbush Jr. has been appointed general service manager, International Business Machines Corp., Schenectady, N. Y. In 4 years' service in the Army, Mr. Ritterbush advanced from private to lieutenant colonel.

—o—

Charles E. Bain Jr., recently returned from more than 3 years' service with the Navy, has been named production manager, F. J. Stokes Machine Co., Philadelphia. Prior to service with the Navy, Mr. Bain was assistant purchasing agent, Hobart Mfg. Co., Troy, O.

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William W. Coutts, effective Feb. 1, assumed duties as executive vice president, Gray Iron Founders' Society, Cleveland and Washington. Mr. Coutts succeeds **W. W. Rose,** who has retired be-

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E. E. HELM

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S. F. STEWART

C. A. ZAPFFE

cause of ill health. Mr. Coutts has served as assistant secretary of the National Screw Machine Products Association.

—o—

S. Floyd Stewart has been elected vice president in charge of engineering, Leece-Neville Co., Cleveland. Mr. Stewart joined the company in 1936 as a research engineer and became chief engineer in 1941.

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Charles M. Bull, Memphis, Tenn., has been appointed assistant general manager in charge of sales and engineering, Avondale Marine Ways Inc., New Orleans. **J. R. Houppert** and **Herman Evans** have been promoted to assistant general managers. Mr. Houppert will be in charge of finance and purchases, Mr. Evans in charge of production.

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Martin C. Delaney recently was appointed secretary and treasurer, Southern States Iron Roofing Co., Savannah, Ga. **Ross Allen** has been named to head the forecasting and budget control department.

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George Hallman has returned to Luria Bros. & Co., as assistant to **Amos Bowman,** vice president in charge of the Pittsburgh office. Major Hallman recently completed 3½ years in the service.

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Arthur H. Starrett has been elected president, L. S. Starrett Co., Athol, Mass. **David Findlay,** president of the company for the past 7 years, has retired after 55 years of service. **William J. Greene,** vice president in charge of sales since 1941, has been elected vice president and director of sales.

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George W. Stout has been appointed to the newly created position of sales promotion manager, Perfect Circle Co., Hagerstown, Ind. **Herman C. Teetor,** who recently returned from service with the Navy as lieutenant commander, succeeds Mr. Stout as advertising and publicity manager. **John C. Senn,** on terminal leave as a major with the Army Air Forces, will resume his duties as assistant advertising manager as soon as his release from the armed forces is effective.

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Carl A. Zapffe, metallurgist, has opened a consulting office and research laboratory at 6410 Murray Hill Rd., Baltimore. From 1943 until 1945 Mr. Zapffe was assistant director, Research Division, Rustless Iron & Steel Corp., Baltimore.

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Charles W. Metcalf has returned to the Fisher Body Division in Oakland, Calif., General Motors Corp., as resident manager, a position he held prior to 1942 when he was transferred to a general special assignment with the corporation.

—o—

E. Kenneth Hughes, 28 years with the Whitehead Iron & Steel Co. Ltd., Newport, England, has been appointed commercial manager of the company.

—o—

Victor Malcolm has been appointed by Republic Steel Corp., Cleveland, as its representative in the United Kingdom, succeeding the late **W. E. Knight.** Mr. Malcolm also will serve as the corporation's general manager and supervisor of its interests in western Europe.

—o—

E. C. Evans, for many years closely associated with scientific research in both the fuel and iron and steel industries, has retired from the British Iron & Steel Research Association, serving until recently as technical secretary of that organization.

—o—

E. F. Browne, warehouse superintendent and **George H. Mood,** secretary, L. Norris Hall Inc., Philadelphia, have resigned. Mr. Browne now is president and Mr. Mood vice president and secretary, York Steel Co., York, Pa., a newly established warehouse for cold finished steel.

—o—

F. J. Staroba, formerly in Milwaukee and **E. Monacelli,** formerly in St. Louis, have been transferred to the Chicago office of the Carboloy Co. Inc., Detroit. **C. W. Powell** succeeds Mr. Monacelli in St. Louis. **R. B. Lewis,** service engineer, has been assigned to the Chicago office.

—o—

Victor R. Sandner has been appointed manager of the Structural Steel Division Moore Dry Dock Co., San Francisco.

—o—

K. U. Wirtz, assistant secretary, Electric Furnace Co., Salem, O., has been promoted to executive vice president. **C. L. West,** vice president, assumes complete charge of all sales and sales engineering. **C. H. Vaughan** has been appointed assistant vice president. Other officers of the company are: **R. F. Benzinger,** president; **F. T. Cope,** treasurer and **R. D. Painter,** secretary.

—o—

Col. Robert Isham Randolph (retired), has been appointed deputy district chief, Chicago Ordnance District, succeeding **Brig. Gen. Thomas S. Hammond,** who has resigned government service to devote full time as chairman, Whiting Corp., Harvey, Ill.

—o—

Dwight E. Adams has resigned as Philadelphia district representative, Heppenstall Co., Pittsburgh, to establish himself in Philadelphia as a manufacturers' representative.

—o—

Gustaf A. Ostrom has been appointed chief research engineer, Alloy Rods Co., York, Pa. Mr. Ostrom formerly was welding engineer for the Foote Mineral Co., Philadelphia.

—o—

L. A. Beeghly has been elected chairman of the board, Cold Metal Products Co., Youngstown. **W. B. Lockwood** is president and **C. M. Beeghly,** vice president.

—o—

James S. Heath recently became a member of the staff, American Steel Warehouse Association Inc., Cleveland.

—o—

Alfred F. Gauron has been appointed field engineer for the New England district, Advance Pressure Castings Inc., Brooklyn, N. Y., and will make his headquarters in Amesbury, Mass.

—o—

R. H. Cannon has been appointed merchandising engineer, Abrasive Division, Norton Co., Worcester, Mass., effective March 1. **W. A. Russell,** recently released from the Navy, succeeds Mr.

ALBERT SCHRUM REPORTS A "CASE HISTORY"

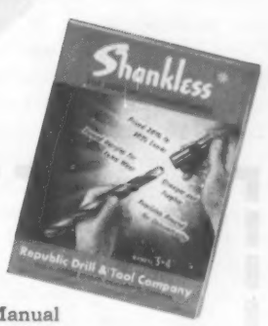
7 TIMES AS MANY HOLES PER GRIND with "Shankless"*

They were getting 25 holes per grind with conventional taper shank drills. When they changed to "SHANKLESS" they drilled an average of 174 pieces per grind on the same job —7 times as many. No wonder this manufacturer now standardizes on "SHANKLESS" —especially since they cost him 20% to 30% less than conventional drills.

Albert Schrum

REPUBLIC Service Engineer

If you use twist drills, it will pay you to get our Manual S-4. It tells the complete story of "SHANKLESS" Roll-Forged Drills. We will gladly send a copy to you on request.



Republic Drill & Tool Co., S-2
322 South Green Street
Chicago 7, Illinois

Please send me a copy of your new Manual which gives the complete story of Republic's "Shankless" Drills.

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City ..... *Zone* .... *State* .....

Republic

ALSO MAKES OVER 100 DIFFERENT TYPES OF CONVENTIONAL HIGH SPEED AND CARBON STEEL DRILLS

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Republic DRILL & TOOL COMPANY

CHICAGO 7, ILLINOIS

BOSTON • NEW YORK PHILADELPHIA • PITTSBURGH • CLEVELAND • DETROIT • DAYTON • BIRMINGHAM • LOS ANGELES • SAN FRANCISCO

WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF TWIST DRILLS

Cannon as abrasive engineer in the Ohio area. **W. A. McCune Jr.**, also recently released from the Navy, has been appointed abrasive engineer, New York-New Jersey area. **N. V. Crabtree** has returned from 4 years with the Army Air Force and is abrasive engineer assigned to the Michigan territory. **W. H. McNeilly Jr.** is abrasive engineer with headquarters in St. Louis and **J. L. Tobey** is abrasive engineer in the Connecticut area.

—o—

Douglas Rader, who recently resigned as advertising manager, Lindberg Engineering Co., Chicago, has joined Norman Press, Chicago.

—o—

Don R. Woolf has been appointed chief blade design engineer, Curtiss-Wright Corp., Propeller Division. Mr. Woolf formerly was chief engineer, American Propeller Corp., a position he held for 3 years.

—o—

William L. Platt has been appointed sales representative at Boston for the Columbia Chemical Division, Pittsburgh Plate Glass Co. He has been with the division for 16 years.

—o—

L. C. Allman, vice president, Fruehauf Trailer Co., Detroit, has been elected chairman of the board of directors, Truck Trailer Manufacturers Association, Chicago.

—o—

Donald H. Gilmore has joined the magnesium sales staff, Dow Chemical Co., Midland, Mich., to serve with the Cleveland office. **Francis T. Furman** has been transferred from the Midland office to the company's New York sales office. **Robert L. Featherly,** recently released from the Navy, returns to the Dow company as a member of its magnesium sales staff on cathodic protection.

—o—

I. C. Smith has been appointed chief engineer, Crocker-Wheeler Division, Ampere, N. J., Joshua Hendy Iron Works.

—o—

Thomas P. Moran has been appointed Detroit district manager, Precision Welder & Machine Co., Cincinnati. Mr. Moran was more than 10 years welding engineer with Ternstedt Mfg. Division, General Motors Corp.

—o—

Harry M. Pflager, who retired recently as senior vice president, General Steel Castings Corp., Eddystone, Pa., has opened offices in the Boatmen's Bank Bldg., St. Louis, to handle his varied personal interests.

—o—

George B. Powell, district sales manager in St. Louis, American Locomotive Co., New York, recently was promoted to assistant to **N. C. Naylor,** vice president. He will continue to have headquarters in St. Louis. **William F. Lewis** succeeds Mr. Powell as district sales manager.

—o—

L. F. Carlson has been appointed manager of advertising and public relations, Oldsmobile Division, General Motors Corp. Mr. Carlson has been associated with that division for the past 4 years. He succeeds **V. C. Havens,** resigned.

—o—

Charles Davidoff has opened offices and laboratories at 198 Broadway, New York, to specialize in chemical and metallurgical investigations. Mr. Davidoff formerly was vice president in charge of chemical engineering, Sam Tour & Co., New York.

—o—

I. L. Goldberg has been named president of the reorganized Topper Structural Steel Co., Columbus, O. **Sol Shaman,** recently returned from service with the Navy, has been appointed treasurer.

—o—

Louis E. Beaupre, former chief of the Industrial Supply Section, War Production Board, has been named assistant general manager, Lectrolite Corp., Defiance, O.

—o—

John W. Thompson, former director of public relations for Ford Motor Co., Dearborn, Mich., announces organization of John Thompson Inc., Detroit, to function in the field of public relations, publicity and related services, with offices at 428 Ford Bldg.

—o—

Kenneth W. Haagensen has been appointed director of public relations, Allis-Chalmers Mfg. Co., Milwaukee. Mr. Haagensen resigned as manager, Postwar Planning Division, Association of Commerce, Milwaukee, to accept the position.

—o—

Sam R. Clement has been named assistant general branch manager, Birmingham sales district of the Monsanto Chemical Co., St. Louis. **G. Y. Frankle** is general branch manager at Birmingham.

—o—

C. E. Finney Jr., assistant vice president, Standard Oil Co. of California, San Francisco, has been elected a vice president of the company.

—o—

Robert B. McColl, president, American Locomotive Co., New York, has been elected a member of the board of directors, General Steel Castings Corp., Eddystone, Pa.

—o—

R. H. Money, until recently manager, electro appliance engineering department, Crosley Corp., Cincinnati, has joined Reynolds Metals Co., Louisville, Ky., as an advisor with the company's Parts Division.

—o—

Richard M. Johnson has been appointed assistant sales manager, Chandler-Evans Corp., West Hartford, Conn. Mr. Johnson has been with the company since 1942 and until his promotion he had been assistant factory manager of the company's Dayton, O., plant.

—o—

Wagner Electric Corp., St. Louis, announces the following changes of personnel: **G. B. Evans,** general superintendent since 1921, has been promoted to plant manager; **C. W. Hesse,** assistant general superintendent, succeeds Mr. Evans as general superintendent. **W. A. Okenfuss** has been promoted to assistant general superintendent, having been head of the time study and operating department since 1927.

—o—

T. A. McMahon has been appointed manager of purchases, J. D. Adams Mfg. Co., Indianapolis, heading the newly consolidated purchasing department

I. C. SMITH

L. E. BEAUPRE

J. A. BAUER

Who has been appointed sales manager, Hanson-Van Winkle-Munning Co., Matawan, N. J., and noted in STEEL, Feb. 11 issue, p. 87.

A. H. GAAL

Who was appointed merchandising manager, Earle M. Jorgensen Co., Los Angeles, noted in STEEL, Feb. 4 issue, p. 112.

J. B. MITCHELL

Who is assistant to the operating vice president, Jones & Laughlin Steel Corp., Pittsburgh, noted in STEEL, Jan. 14 issue, p. 74.

which combines production material, handling equipment and supplies.

—o—

George A. Fisher Jr. has been placed in charge of the newly established St. Louis technical section, Development & Research Division, International Nickel Co. Inc. That office will serve the territory including Missouri, southern Illinois, southwestern Iowa, northern Arkansas, western Tennessee, Nebraska and Kansas.

—o—

Sidney R. Best has been appointed advertising manager, R. K. LeBlond Machine Tool Co., Cincinnati, succeeding **Walter L. Rybolt.**

—o—

Creston E. Kite, recently resigned as district manager for the metropolitan New York area, E. F. Houghton & Co., Philadelphia, to become assistant to **H. H. Harris,** president of General Alloys Co., Boston.

—o—

John T. Benedict has returned to the sales department, Hurley Machine Division, Electric Household Utilties Corp., Chicago, after four years' service with the Army.

OBITUARIES...

John W. O'Leary, 70, Chicago banker, industrialist and consulting engineer, died Feb. 8 in Lake Forest, Ill., of injuries sustained in an automobile accident. Mr. O'Leary, early in his career, was associated with Arthur O'Leary & Son Co., now the Kelly Steel Works, of which he was a director. He had served as president of the Chamber of Commerce of the United States, the National Metal Trades Association and the Chicago Association of Commerce.

—o—

S. Wells Utley, 66, president and general manager, Detroit Steel Casting Co., Detroit, died Feb. 13 in Detroit. He joined the Detroit Steel Casting Co. in 1906 and became president in 1932. Mr. Utley was a past president of the American Foundrymen's Association, also the National Founders' Association.

—o—

Walter L. Cherry, 72, chairman of the executive committee and former president, Cherry-Burrell Corp., Chicago, died Feb. 5 in Evanston, Ill.

—o—

Mortimer Middleton, 50, since 1921 associated with SKF Industries Inc., and for the past 4 years Chicago district manager, died Feb. 5 in Winnetka, Ill.

—o—

Gustav A. Heckscher, 76, retired steel manufacturer who was associated for many years with the steel company, Richard Heckscher & Sons and later, after its merger, with Alan Wood Steel Co., Conshohocken, Pa., died recently in Philadelphia.

—o—

John W. Sutton, 54, for the past 15 years a member of the sales staff, Hamilton Steel Co., Cleveland, died Feb. 7 in that city.

—o—

William R. Werther, assistant chief metallurgist, Algoma Steel Corp. Ltd., Sault Ste. Marie, Ont., died Feb. 4.

—o—

William T. Morris, 61, president, American Chain & Cable Co. Inc., Bridgeport, Conn., died recently in New York following a year's illness.

—o—

Carl F. Lemke, 73, president, Champion Spring Co., Cleveland, died recently in Ft. Lauderdale, Fla. Mr. Lemke was elected president of the company in 1920.

—o—

Harry J. Westmeyer, 51, superintendent, Carlton Machine Tool Co., Cincinnati, died recently in that city. Mr. Westmeyer had been superintendent of the machine tool company for the past 18 years.

—o—

Herbert W. Reinker, 54, who had been associated with McKinney Steel Co. and its successor, Republic Steel Corp., Cleveland, since 1926, died recently at his home in Lakewood, O.

—o—

George J. Freedley, 78, retired president, Cardwell Machine Co., and one time head of Virginia Forgings & Mfg. Co., both of Richmond, Va., died Feb. 10 at Chestnut Hill, Pa.

—o—

Samuel Shafer Jr., 67, head of the patent department, Chain Belt Co., Milwaukee, died Feb. 4 in that city. Mr. Shafer had been associated with the company 42 years.

—o—

H. Alan Tremaine, 40, president, T. & F. Engineering Co., East Cleveland, O., died recently in New York.

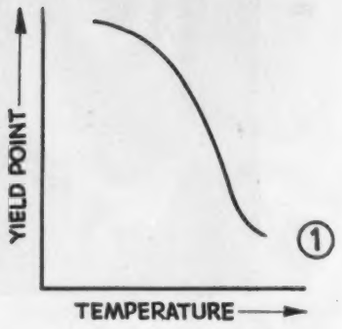
—o—

William W. Chase, 72, a former president, White Sewing Machine Co., Cleveland, died recently in that city. He was made president of the White company in 1914 and held that post 8 years.

INSURING DIMENSIONAL ACCURACY *through Heat Treating*

By HERBERT DOBKIN
Materials Engineer
Special Projects Department
M. W. Kellogg Co.
Jersey City, N. J.

Co-ordination of heat treating processes with processing of parts through machining operations is necessary to make sure that close tolerances required actually are obtained. Suitable stress relief a vital factor in controlling residual stresses existing in raw materials or induced by machining



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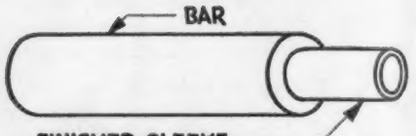

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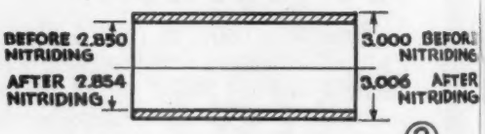

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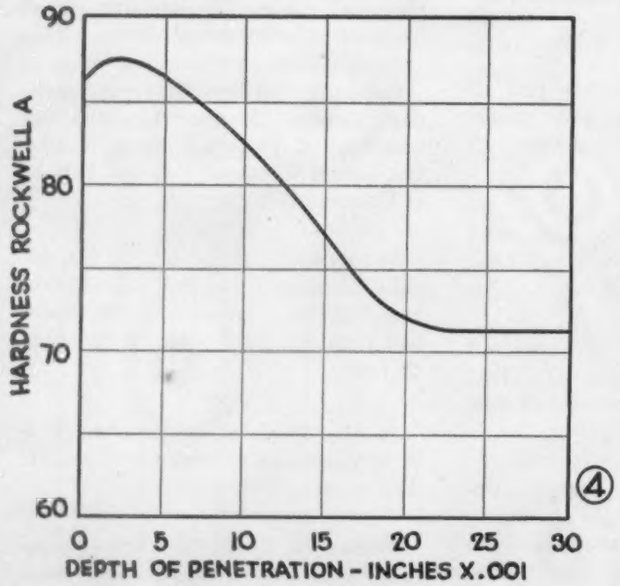

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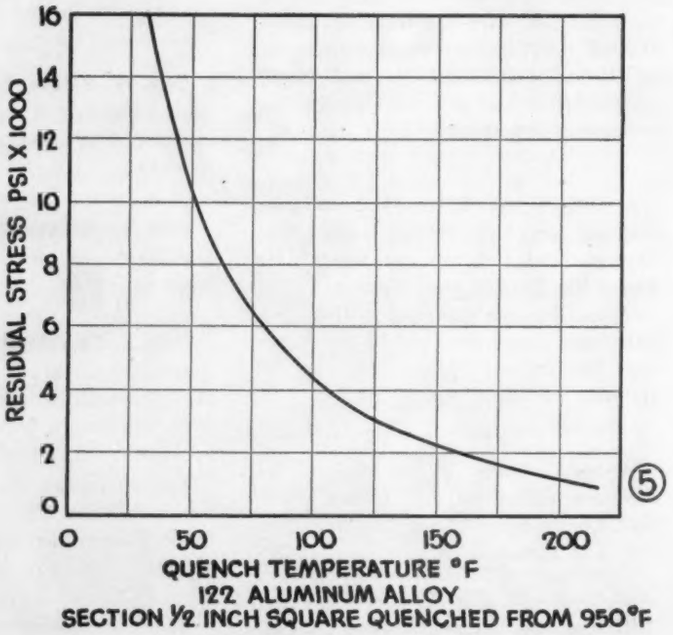

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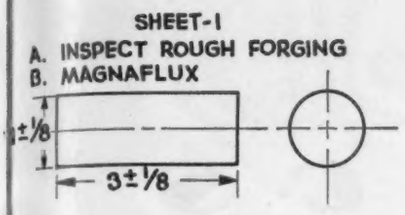

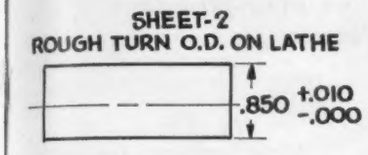

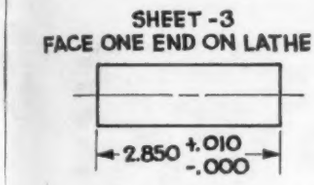

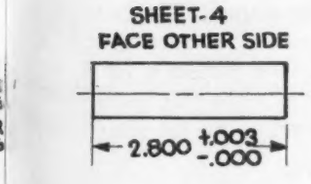

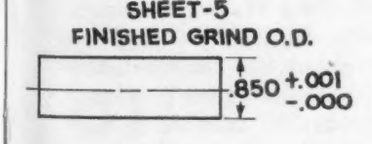

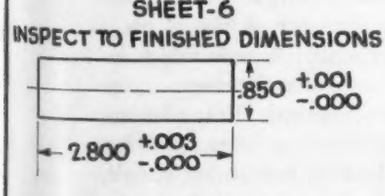

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MANUFACTURE of parts to close tolerances is a matter which requires considerable co-operation between the shop supervision, the machine operators, and the plant metallurgist. As far as the latter is concerned, his functions are varied, and may be classified broadly into three main functions as follows:

(1) Selecting and specifying the proper materials for the various parts.
(2) Making certain that materials received actually meet the specifications.
(3) Co-ordinating the processing of parts through the heat treating operations with the processing of parts through machining operations to make sure that close tolerances required are actually obtained.

In connection with the first two points, the functions of the metallurgist are fairly well established. The service requirements of the various parts must first be studied from the standpoint of stress analysis, temperature of operation, wear resistance, corrosive conditions, etc., and the proper materials selected for their manufacture from the standpoint of suitability, cost, availability, and machinability. In addition, decisions must be made as to the form in which the raw material shall be purchased, whether forged, cast, or bar stock.

When these factors have been decided and the design of all forgings and castings have been approved to make certain that they are feasible from a production standpoint, suitable purchasing specifications must be written to adequately cover all the requirements. Whenever necessary, the written specifications should include hardenability requirements to insure uniform heat treating results in later operations.

Upon receipt of the raw material, it should be subjected to careful inspection to make certain that the specification requirements have been met. Careful checking at this point is very important, as considerable time and money can be saved through the elimination of faulty material before any costly machining operations have been performed. This raw materials inspection should include such items as routine chemical checks, hardness checks, hardenability checks, and Magnaflux, Zyglo, x-ray, or supersonic examinations for flaws in addition to any dimensional inspections which may be required. The receiving inspection requirements should be fully as rigid as the specification requirements, to make sure that no material is released for manufacture which is outside the specification limits.

Taking the precautions outlined only makes certain that good raw material is received in the shop. The metallurgist must then do his part to insure the success of the machining operations to come, which brings us to his third, and perhaps most important, function.

When parts are to be manufactured to close tolerances, every machine operation is determined in advance as to the type of machine to be used, amount of material to be removed, and types of jigs and fixtures to be used. Individual drawings then are made on separate sheets to show the details of each operation, and they are numbered in the proper sequence so that the complete set of process sheets includes every step in the manufacture of the part from start to finish.

Fig. 6 shows a simplified version of the processing of a plug which is machined from a solid forged cylinder.

If the part being machined requires any heat treating, there also should be process sheets which give complete, detailed heat treating information. If the part is hardened in the heat treating operation, the heat treating must be performed when only a small amount of finish machining remains, in order to minimize machining difficulties. For instance, in Fig. 6, any hardening operation would be performed after operation 3, when only 0.009 to 0.010-in. remain to be ground from the diameter, and only 0.047 to 0.060-in. remain to be faced off the end. Since only small amounts of material remain to be removed after heat treating, care must be taken to avoid

(*Please turn to Page* 104)

Fig. 1—General manner of variation of yield point with temperature

Fig. 2—Example of part with tendency to spring out of round after parting cut

Fig. 3—Example of growth of a thin-walled sleeve during nitriding

Fig. 4—Depth of penetration versus hardness after nitriding 48 hr at 975° F

Fig. 5—Effect of quenching temperature on residual stress level for typical aluminum alloy

Fig. 6—Example of processing schedule calling for machining a plug from a solid forged cylinder

Metal Coated PLASTICS

Plated plastics, already established, may find many uses in both decorative and engineering applications. Physical property and other data provide basis for properly evaluating their possible usefulness

WHAT will plastics do in the future? Where will they fit into the picture of production and fabrication of consumer goods? What will be their relation to metals—steel, aluminum, magnesium — that of competition or supplementation? These are typical of many questions in the minds of industrial engineers and manufacturers now that the word "plastics" has become to many a symbol of the better things for living to come in the postwar world. Perhaps more than for any other industry the war has been a proving ground for plastics—resulting in new materials, improved techniques and utility applications brought about by the necessities of war. In many instances plastics assumed wartime jobs which stand in amazing contrast to their former peacetime roles.

Combination of metals with plastics by electroplating[1] points the way to new and important uses for plastics in a variety of applications. Plated plastic parts and materials having the outward appearance and properties of metals are expected to find many uses in the manufacture of such articles as automobile and electrical hardware, the aircraft and electronic field, office equipment, tableware, jewelry and many other specific applications. Metal plated plastics have opened up vast new fields in electricity, radio, and electronics—and it is particularly in these fields that important war contributions were made.

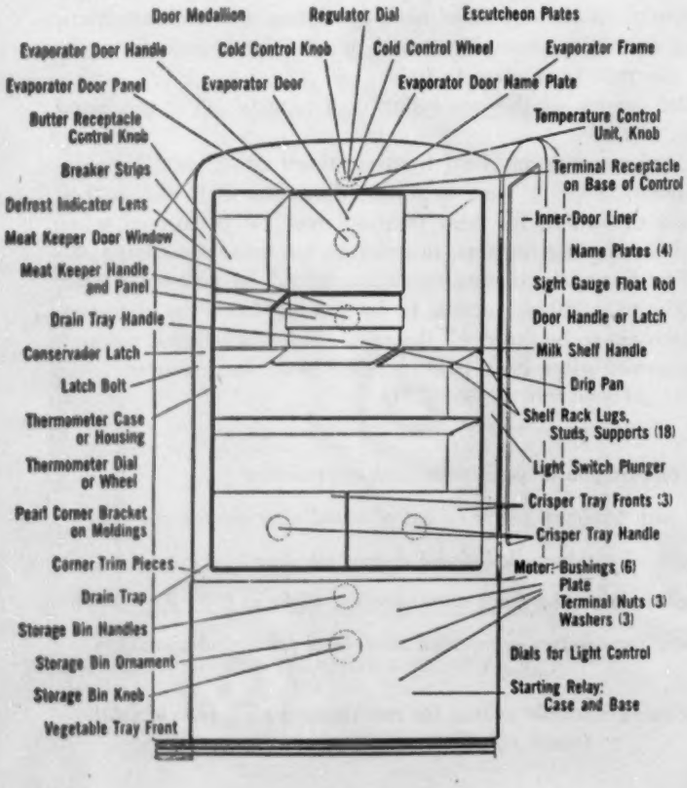


Fig. 1—Plastic parts on 1942 model refrigerator. (Courtesy E. I. du Pont de Nemours & Co. Inc.)

Many of the rapidly increasing engineering applications for plastics have been made possible by the perfection of processes for electroplating plastics with metals. Practical methods are available today for large-scale electroplating of plastics whereby it is possible to plate the entire surface or part of the surface of a non-conductive plastic object of almost any shape with smooth, adherent, relatively non-porous metal coatings of the desired thickness with specific physical properties. Just as in the case of electroplating of metals, the electroplating of plastics maintains the close details of the underlying surface. The first commercially successful method of plating plastics was patented in 1938. At the present time the process is sufficiently advanced in production use that it has met specifications and standards of precision required by the army and navy.

Properties of Metal-Plated Plastics

What are the valuable properties that metal coatings give to plastics that the plastics would not have otherwise? On the practical side the finished object has acquired by virtue of the coating a proportion of the physical characteristics of a metal product yet retaining the light weight of plastics and the economics of forming into complicated shapes. From the decorative point of view plated plastics combine the brilliant color which can be achieved only with synthetic resins together with the gleam of metal giving promise of products with utmost in eye-appeal. Some other advantages of metal coated plastics and typical applications of such combinations are presented here:

Electrical Conductivity—Metals as conductors and plastics as insulators represent major engineering uses of each. Metal plated plastics are used for applications in which intricate shapes of conductor and insulator are necessary or in which thin layers of metal are required. Examples are airplane, antenna masts, direction-finding loops, shielded housings, Faraday shields, condensers, instrument panels, high frequency wave guides, slip rings, special commuta-

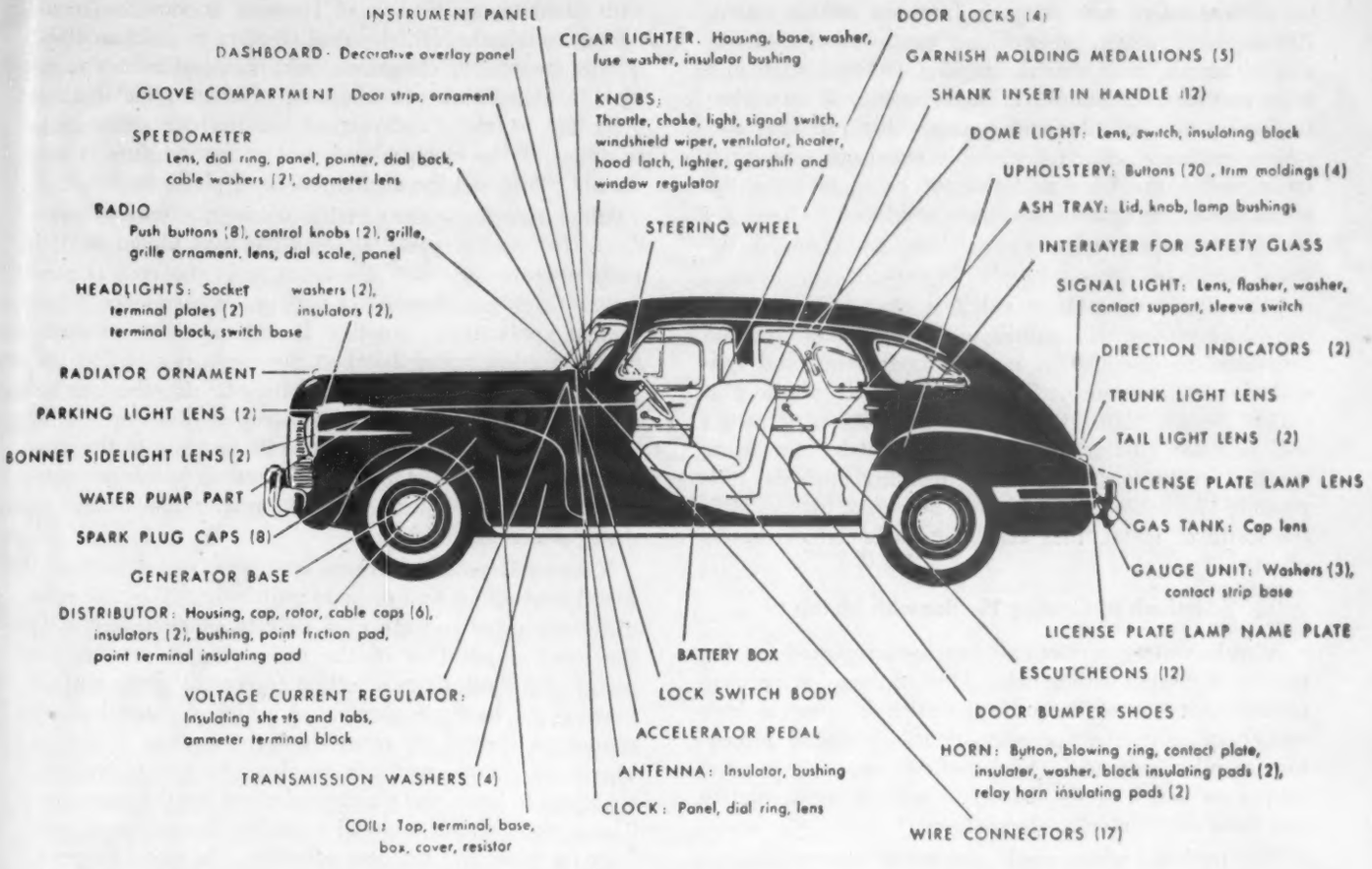

INSTRUMENT PANEL
DASHBOARD · Decorative overlay panel
GLOVE COMPARTMENT Door strip, ornament
SPEEDOMETER
Lens, dial ring, panel, pointer, dial back, cable washers (2), odometer lens
RADIO
Push buttons (8), control knobs (2), grille, grille ornament, lens, dial scale, panel
HEADLIGHTS: Socket washers (2), terminal plates (2) insulators (2), terminal block, switch base
RADIATOR ORNAMENT
PARKING LIGHT LENS (2)
BONNET SIDELIGHT LENS (2)
WATER PUMP PART
SPARK PLUG CAPS (8)
GENERATOR BASE
DISTRIBUTOR: Housing, cap, rotor, cable caps (6), insulators (2), bushing, point friction pad, point terminal insulating pad
VOLTAGE CURRENT REGULATOR: Insulating sheets and tabs, ammeter terminal block
TRANSMISSION WASHERS (4)
COIL: Top, terminal, base, box, cover, resistor
CIGAR LIGHTER. Housing, base, washer, fuse washer, insulator bushing
KNOBS: Throttle, choke, light, signal switch, windshield wiper, ventilator, heater, hood latch, lighter, gearshift and window regulator
STEERING WHEEL
BATTERY BOX
LOCK SWITCH BODY
ACCELERATOR PEDAL
ANTENNA: Insulator, bushing
CLOCK: Panel, dial ring, lens
DOOR LOCKS (4)
GARNISH MOLDING MEDALLIONS (5)
SHANK INSERT IN HANDLE (12)
DOME LIGHT: Lens, switch, insulating block
UPHOLSTERY: Buttons (20), trim moldings (4)
ASH TRAY: Lid, knob, lamp bushings
INTERLAYER FOR SAFETY GLASS
SIGNAL LIGHT: Lens, flasher, washer, contact support, sleeve switch
DIRECTION INDICATORS (2)
TRUNK LIGHT LENS
TAIL LIGHT LENS (2)
LICENSE PLATE LAMP LENS
GAS TANK: Cap lens
GAUGE UNIT: Washers (3), contact strip base
LICENSE PLATE LAMP NAME PLATE
ESCUTCHEONS (12)
DOOR BUMPER SHOES
HORN: Button, blowing ring, contact plate, insulator, washer, black insulating pads (2), relay horn insulating pads (2)
WIRE CONNECTORS (17)

Fig. 2—Plastic parts on typical automobile. (Courtesy E. I. du Pont de Nemours & Co. Inc.)

tors, piezo electric crystals, and contacts for electrical leads. Copper and silver are the metals most widely used for this purpose.

Light Reflection—Mirrors have many industrial and decorative uses, and metals are by far the best reflectors. Silver is the metal initially and still most widely used for this purpose, although gold, rhodium and aluminum find industrial applications, and copper decorative applications. The production of mirrors on glass was the first commercial application of metals on nonconductors and still is a large industry. There is considerable interest and activity today in the production of mirrors on plastics.

Weight—Plastics are frequently used for their lightness. In applications where a metal surface is desirable for impact and abrasive resistance and reflectivity, the use of a metal plated plastic combines both lightness and the necessary metallic properties. It is interesting to note that if a one-foot square glass mirror used in an airplane is replaced by one of similar thickness in a transparent plastic it will earn about $1 in extra mail for each trip.

Heat Resistance—Plastics, especially the thermoplastics, have limited heat resistance. A metal coating helps to dissipate the heat and considerably raises the distortion temperature, especially for applications where there is localized heating. Similarly, the metal coating increases the dimensional stability of plastic pieces subjected to temperature changes below the distortion temperature. Phenolics which normally stand 300° F can be made to resist 500° F. The metal coating prevents localized overheating and assures more rapid return to normal temperature by conduction and radiation characteristics of outer metal coating.

Water Absorption—By completely covering the plastic with a metal coating absorption of water, oil, and other solvents is greatly reduced or rendered nil, depending on the thickness of metal applied. Thus cellulose acetate (Table II) which absorbs 3.1 per cent water in 24 hours has this reduced to 0.9 per cent when plated with approximately 0.003 in. of metal such as copper.

Tensile Strength—The strength of a plastic may be increased from 10 to 30 per cent by plating (Table I). These tensile strength values taken from results on rectangular strips may vary somewhat depending on design of the plastic part, thickness and also according to the nature of metal plated.

Corrosion Resistance—The corrosion resistance of metals plated on plastics is, as would be expected, superior to that of the same metal plated on a metallic base because of the elimination of electrolytic potentials between dissimilar metals. Since the plastic base is inert there can be no electrolytic action resulting in corrosion between the synthetic base and metallic coating. A series of experiments[2] have been carried out to compare corrosion progress on plated plastics and plated metal products. As is generally known metal coated diecastings, finished in successive layers of copper, nickel, chromium, begin to corrode at the base metal, probably through pores in the coating, the corrosion starting under the base coat of copper finally resulting in flaking of the entire plate. However, with a non-corrosive base material, such as plastics, corrosion cannot start under the surface. Compared with ferrous base materials, when a plated plastic fails under salt spray no rust spots develop. Observations have shown that

the surface wears away resulting from the erosion action. Electroplated metals, by providing contacts between dissimilar metals, may corrode rapidly under marine and other corrosive conditions. A single metal coat on a plastic having no dissimilar metal contact has excellent corrosion resistance. Even if multiple metal coats are used on a plastic, the basic material not being metallic, the combination has superior corrosion resistance to the same multiple layers applied to a metal base, particularly if the metal base is ferrous as is usually the case.

Other Properties—Other valuable engineering properties which plating will contribute to plastics are vibration resistance, so essential for many aircraft items, and general abrasion resistance. The choice of right plastic plus correct design, plated with proper formulation of metals will produce articles of construction suitable for many specific applications. By use of masking methods, it is possible to combine the color and beauty of plastics with the lustre of metal, thus achieving enhanced decorative effects.

Methods of Coating Plastics with Metals

A wide variety of methods has been reported for the coating of plastics with metals. Most of them have proven unsatisfactory or of limited application because of high cost, poor adherence, porosity, poor mechanical properties, or other reasons. These methods may be classified into those which apply the metal without electroplating and those which involve electroplating.

The methods which apply the metal without electroplating include metal spraying, vacuum deposition, and chemical reduction to yield a metal film. In the electroplating methods, the surface of the plastic must first be made conductive and the methods employed for this purpose include application of waxes and then coating with graphite, application of lacquers or varnishes containing metal powders, chemical reaction to yield an electrically conducting compound, and chemical reduction to yield a metal film. In addition, of course, metal films deposited by metal spraying or vacuum deposition may subsequently be electroplated, but such procedure is not usually considered the electroplating of plastics.

Metal Spraying—The metal in the form of wire or powder is fed into a special oxy-gas gun and blown on the surface being coated. In general, a brittle coat is produced with a granular surface and, as a consequence it has limited application. Another limitation is the necessity for using a low-fusing metal on thermoplastics so that the plastic will not be burned or softened. If other metals are desired, they can be sprayed or plated on top of the initial coat. Metal spraying finds its best use in the production of relatively thick films of metal, which are subsequently machined or ground to proper dimensions or required surface finish.

Vacuum Deposition—There are two of these methods: Metal evaporation and cathode sputtering. They are relatively expensive and are used only in special cases, e.g., the exact duplication of the underlying surface as for sound recording, light reflection (especially front surface mirrors), or for the production of a film of a metal which cannot be applied by other methods, such as a film of aluminum. Both methods involve the use of vacuum chambers to house the plastic and carry out the operation. The surface of the material must be cleaned very carefully for good and uniform adhesion. In metal evaporation the metal is contained in a small crucible or is in the form of a filament and is heated causing the evaporation of metal atoms which condense on the plastic and all other cool surfaces in the chamber. A vacuum of 10^{-3} mm. Hg or better is required. In cathode sputtering the plastic is

TABLE I

TENSILE, IMPACT AND FLEXURAL STRENGTH COMPARISONS BETWEEN UNPLATED AND PLATED PLASTIC TEST SPECIMENS
Test Methods Prescribed by ASTM (Electrochemical Society Preprint 88-3 1945)

Plastic Specimen (See Key)	Tensile Strength* (Psi)			Impact Strength* (Notched Izod ft lb per in. of notch)			Flexural Strength* (Psi)		
	Unplated	Plated**	% Increase	Unplated	Plated**	% Increase	Unplated	Plated**	% Increase
A									
(a)	9,525	10,500	10.2	0.33	0.40	21.2	14,000	16,775	19.8
(b)	7,750	9,000	16.2	0.30	0.38	26.6	12,000	14,500	20.8
B									
(a)	12,700	14,225	10.7	7.20	8.50	18.1	15,500	17,820	12.7
(b)	12,000	14,100	17.5	9.30	11.00	18.3	23,000	28,000	21.7
C									
(a)	9,225	10,525	14.1	0.52	0.65	25.0	11,500	12,750	10.9
D	7,500	8,775	17.0	0.28	0.33	21.4	12,000	13,500	12.5
E	6,500	7,250	11.5	0.24	0.31	29.2	9,500	10,750	13.1
F	9,250	10,125	9.4	1.00	1.20	20.0	7,500	9,000	20.0
G	10,050	11,250	12.0	1.10	1.30	18.2	13,000	15,000	15.4
H	6,775	8,650	27.7	...	...	...	.....	.....	...
I	7,500	9,100	21.4	0.90	1.10	22.2	15,000	17,250	15.0
J	4,775	6,225	30.4	0.30	0.36	20.0	12,750	14,750	15.7
K	10,250	11,750	14.7	0.35	0.41	17.1	10,000	12,000	20.0
L	5,775	6,725	16.4	2.40	2.95	22.9	6,500	7,765	17.9
M	7,500	8,600	14.7	5.50	6.40	16.3	9,250	10,650	15.1
N	4,450	5,200	16.8	4.70	5.40	14.9	8,770	10,050	14.6

* Values given are averages of three test specimens.

** Plastic test specimens were plated with 0.0003 in. (7.6 microns) copper and 0.0005 in. (12.7 microns) cadmium.

Key to plastic materials

A—Phenol-formaldehyde (molding type).
(a) No filler.
(b) Wood flour filler.
B—Phenol-formaldehyde (laminated type).
(a) Paper base.
(b) Asbestos base.
C—Phenol-formaldehyde (cast type).
(a) No filler.
D—Urea-formaldehyde.
E—Melamine-formaldehyde.
F—Casein.
G—Vinyl chloride acetate.
H—Polyvinyl chloride.
I—Vinylidene chloride.
J—Polystyrene.
K—Methyl methacrylate.
L—Cellulose acetate.
M—Cellulose nitrate.
N—Ethyl cellulose.

placed on or near the metal surface which is made the anode, and the metal to be deposited is made the cathode. Under the influence of a high voltage, 10,000 v or more, metal atoms in the form of ions leave the cathode and deposit on the plastic. A vacuum of 1 to 10^{-2} mm. Hg is best. Vacuum deposition methods are slow and tedious compared to other methods, because the chamber must be charged and evacuated, then the metal deposited, and finally the vacuum must be broken and the chamber emptied. Furthermore, the metal deposition process itself is lengthy, except for extremely thin films on the order of 10^{-6} in. or less.

Conductive Organic Coatings—The application of a binder and a conducting material is a very old procedure. The wax method is extensively used for electrotyping and the production of molds to be stripped, but cannot be used if any degree of adherence of the metal to the plastic is required. The method involves coating the object with warm liquid wax, allowing to cool, and dusting with graphite or spraying with a graphite suspension. An alternative method is to coat the object with a tacky substance and rub in a metal powder either with a soft brush or the fingers.

A disadvantage of these methods is relatively low conductivity, so that a number of fine wire contacts must be made prior to electroplating. Furthermore, the plating starts at the contacts resulting in greater thickness at these points. One method of increasing the conductivity of graphite coats is to dust with iron powder and then immerse in a copper sulphate solution, depositing copper by replacement. The most convenient method of making plastics electrically conducting is the lacquer or varnish method which involves brushing, dipping, or spraying a bronzing mixture which contains a relatively large amount of copper, silver or other metal powder. This is a one-step method requiring simple equipment and, if silver powder is used, the coating has excellent conductivity. A disadvantage is time required for the coating to dry.

Conductive Chemical Compounds—The application of conductive chemical compounds is interesting but has not yet proven commercially feasible. One method involves coating the object with shellac, then immersing in a solution of silver nitrate in alcohol, drying and exposing to hydrogen sulphide. This produces a film of silver sulphide which conducts electricity sufficient for plating.

Reduced Metals—Chemical reduction methods include the deposition of metals from unstable gaseous compounds and the reduction of metallic compounds in solution. An illustration of the former is the deposition of nickel from

(*Please turn to Page* 136)

TABLE II

HEAT DISTORTION—WATER ABSORPTION COMPARISON BETWEEN PLATED AND UNPLATED PLASTIC TEST SPECIMENS

(Electrochemical Society Preprint 88-5, 1945)

Plastic Specimen (See Key)	Distortion under Heat (°F)* Unplated	Plated**	% Increase	Water Absorption in 24 Hours Unplated	Plated**	% Decrease
A						
(a)	260	490	88.5	0.21	0.04	80.9
(b)	275	510	85.5	0.44	0.12	72.7
B						
(a)	320	470	46.8	3.5	0.12	96.5
(b)	370	490	32.4	1.9	0.10	94.6
C						
(a)	175	250	42.8	0.50	0.03	94.0
D	260	320	23.0	1.6	0.05	96.9
E	270	410	51.8	0.14	0.02	86.7
F	300	425	41.6	15.0	3.0	80.0
G	150	205	36.7	0.13	0.04	69.2
H	170	225	32.4	0.42	0.11	73.9
I	180	250	38.9	0.08	0.02	75.0
J	170	235	38.2	0.01	0.00	100.0
K	155	250	61.3	0.35	0.03	91.4
L	160	205	28.2	3.1	0.09	97.1
M	145	200	27.5	0.90	0.03	96.6
N	175	225	28.6	1.2	0.05	95.9

* Values given are averages of three test specimens.

** Plastic test specimens were plated with 0.003 in. copper and 0.0005 in. cadmium.

(For key to plastic materials, see Table I).

TABLE III

COMPARISON OF CORROSION RESISTANCE OF PLATED PLASTICS WITH PLATED STEEL

Results Obtained By Immersion of Plate Steel and Plated Plastic Test Specimen in Synthetic Sea Water. (Electrochemical Society Preprint 88-5 1945)

Test No.	Basis Material	Plating Sequence Applied	Total Time of Immersion in Salt Solution* in Hours and Condition of Test Panel 24	48	72	96	120	144	168	192	240	264
1	highly buffed steel	0.0004 in. copper, 0.0002 in. nickel and 0.00002 in. chromium†	** A	A	B	C	D					
2	highly buffed steel	0.0008 in. copper, 0.0002 in. nickel and 0.00002 in. chromium						A	B	C	D	
3	highly buffed steel	0.001 in. copper, 0.0002 in. nickel and 0.00002 in. chromium						A	A	B	C	D
4	Phenol-formaldehyde resin (cast type)	(Same as in Test No. 1)	A	A	A	A	A	S	T			
5	Phenol-formaldehyde resin (cast type)	(Same as in Test No. 2)						A	A	A	S	T
6	Phenol-formaldehyde resin (cast type)	(Same as in Test No. 3)								A	A	S

* *Synthetic Sea Water*—(U. S. Army Spec. No. 2-122).

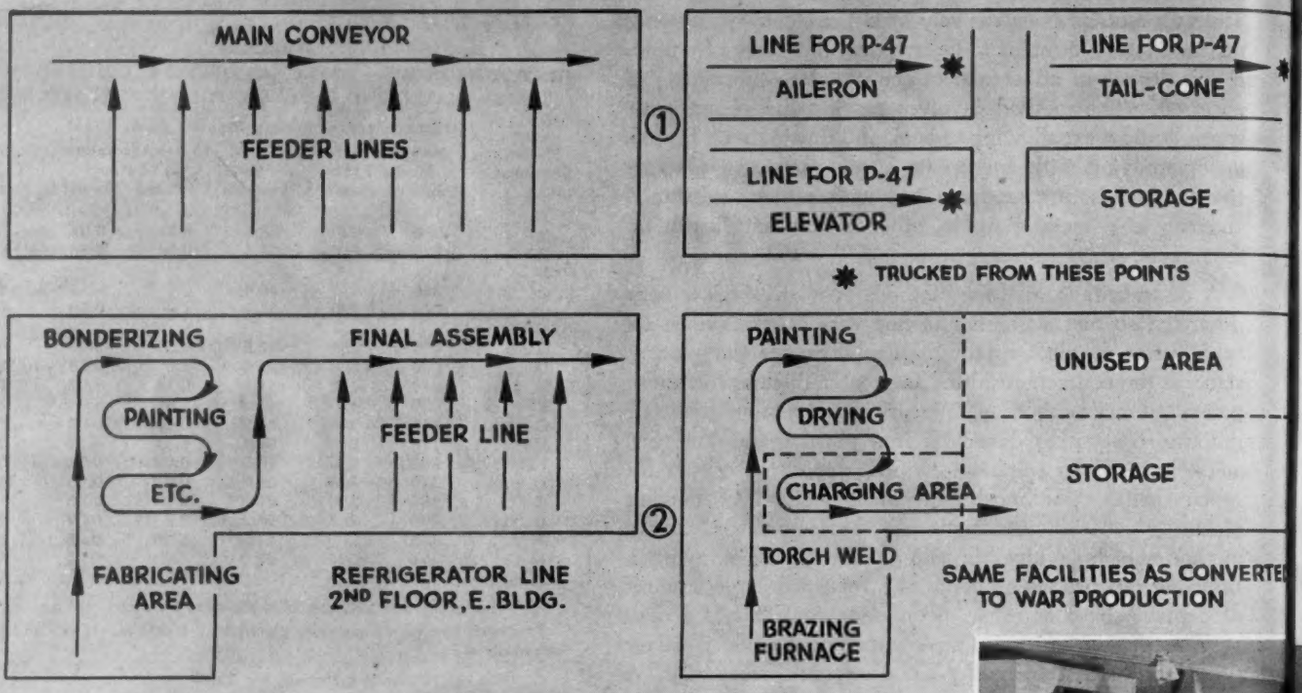
Magnesium chloride, Hexahydrate	11.0 g./L of solution
Anhydrous calcium chloride	1.2 g./L of solution
Anhydrous sodium sulphate	4.0 g./L of solution
Sodium chloride	25.0 g./L of solution

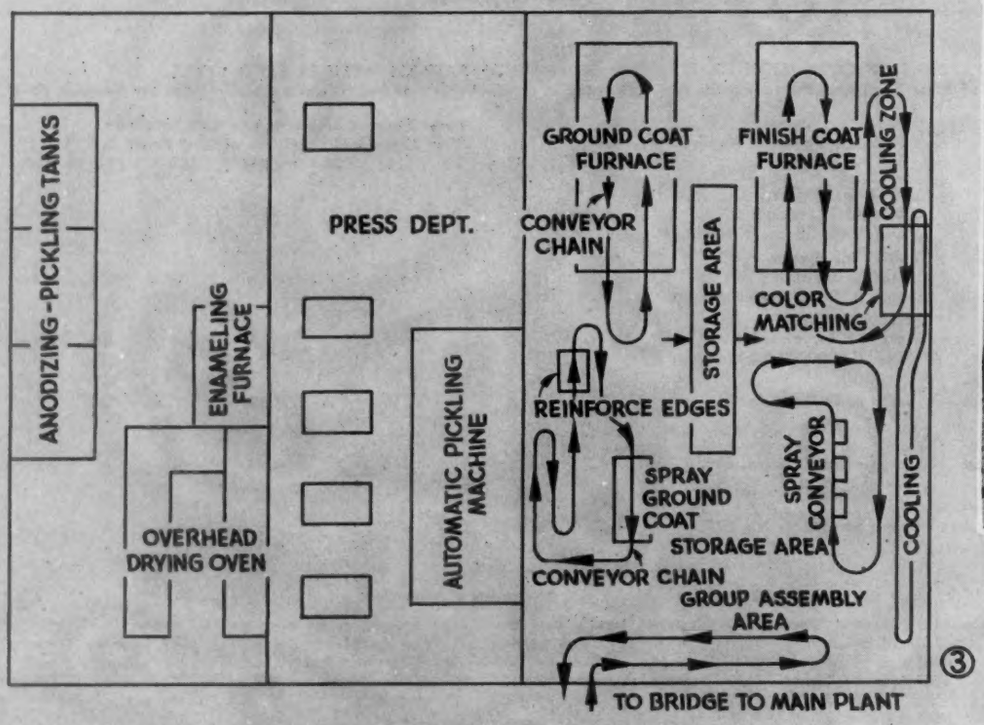
** *Symbol Explanation.*

(A) Perfect condition, no rust or corrosion products.
(B) Minute scattered points of rust.
(C) Slightly rusty over entire panel.
(D) Very noticeably rusty.
(S) Minute pin-points of corrosion.
(T) Increase in number of pin-points and formation of corrosion products.

† 0.0001 in. = 2.5 microns.

RECONVERSION





Westinghouse Mansfield plant, with 99.12 per cent cancellations on V-J Day, successfully accomplishes tremendous job in 3 months, or half the time originally estimated for the work. At the same time, program for ultimate 50 per cent expansion in capacity over prewar is meshed in with operations

By G. W. BIRDSALL
Associate Editor, STEEL

COMPARATIVELY few metalworking plants were called upon to make as complete an about-face in changing over to war production and back to civilian goods as the Westinghouse plant at Mansfield, O. Normal line of household appliances produced here includes electric ranges, roasters, refrigerators, toasters, water heaters, laundry equipment and the like. Products were so selected as to level out the manufacturing load over the year—peak demand for small appliances coming in the fall, refrigerators in the spring, etc.

War production involved some 70 contracts covering more than 48 different items including binoculars, armor piercing shot, tank telescopes, radio communication equipment, gun stabilizers for tanks, insecticide dispensers, and parts for aircraft—engine mounts, elevators, wing flaps, cargo floors, etc. Development and production was also done on the famed V-T fuse, the radar set carried in the nose of a shell. It explodes the missile as it comes into the vicinity of its target, being set off without the need for actually striking the target.

Yet in spite of this amazingly complex conversion to war production, all these various war jobs were cleaned up, new production lines set up, materials obtained, workmen trained and production was an actuality within three months after V-J day. But we are getting ahead of our story . . .

In a recent interview, C. L. VanDerau, works manager of the Mansfield plant, related how Westinghouse began its Mansfield operations in 1918 when the company purchased the Baxter Stove Works there and moved its fac-

Fig. 1—During the war, Westinghouse converted the third floor of Building E at Mansfield, O. to the production of aircraft parts, as shown on opposite page. Diagrams shows how area was utilized both before and after the war in producing electric ranges

Fig. 2.—Shows the arrangement of refrigerator line, second floor Building E and the setup for producing insecticide dispensers. In this case, part of the conveyor lines were used for war work

Fig. 3—Schematic diagram of the enameling plant

war, spray booths were used for applying zinc chromate primer to aircraft parts.

Fig. 4—Spraying finish on refrigerator cabinets prior to baking. Each cabinet gets two coats. During the

Fig. 5—This machine completes 126 spot welds in less than 20 sec in attaching refrigerator back panels

Fig. 6—In this unusual bulldozer operation, flat sheets are formed into a large "U" to form the sides and top for domestic refrigerators now being built in the Westinghouse Mansfield plant

Fig. 7 — Completed refrigerators pass through a "Tunnel of Light" for final inspection before being dispatched to the shipping platform

tory from Flint, Mich., to Mansfield. Production of electric ranges was thus responsible for Westinghouse coming to Mansfield. While the range was the plant's first product, electric refrigerators have since become the major item, rerfigerators comprising more than half the total output of this plant.

Most recent plant expansion began back in 1940 when $2 million was spent to increase the output of civilian goods by 25 per cent. Some $300,000 of this went to increase facilities in the porcelain enameling plant. Production during the first 8 months of 1941 held up this expanded schedule.

Shortage of materials cut refrigerator output in half by September, 1941, and refrigerator production was discontinued completely by May, 1942. Ranges and other items came down to the 50 per cent level by October, 1941, but were not entirely discontinued until the following April-May, 1942.

Mr. VanDerau revealed that when we first entered the war in 1941, the company expected to be able to continue manufacture of civilian items at about 50 per cent of the prewar rate. So, first war items were produced on lines set up in warehouse and storage space, in order to leave regular production lines intact.

When production of all civilian goods was finally discontinued, it was so late in the war production picture that the only jobs available were the tough ones other plants did not want. This somewhat complicated the war production picture. Also it accounts for the fact that war output was increasing right up to V-J day. Most items being handled in spring of 1945 were for the Pacific theater and thus not affected by V-E day cutbacks.

Ending of hostilities proposed a tough reconversion job because the plant was in full swing and because on V-J day, Aug. 14, 1945, orders amounting to more than $56 million were cut to about half a million—cancellations amounting to 99.12 per cent. Inventory was about $14 million, all government jobs.

Plant was closed balance of that week, then all inventory was moved into warehouses, equipment was ripped out and inventory cleared—in about another week. Plant maintenance group was tripled and 18 outside contractors were called in to set up production lines for civilian goods.

Back Into Production: Mr. VanDerau reports an amazingly successful reconversion with more than 90 per cent of intermediate program completed as of Nov. 15, as well as some 26 per cent of the expanded program. Intermediate program is aimed at 100 per cent of prewar output,

(*Please turn to Page* 110)

Fig. 8—Assembling heating elements in the range department

Fig. 9—Electric range body subassemblies are clamped in this holding and locating fixture and joined by means of 35-kva portable spot welding guns. Several of these fixtures are used on the stove line

Fig. 10—Section of the electric range assembly line. Note conveyor for bringing parts and materials, including insulation, within easy reach of workmen

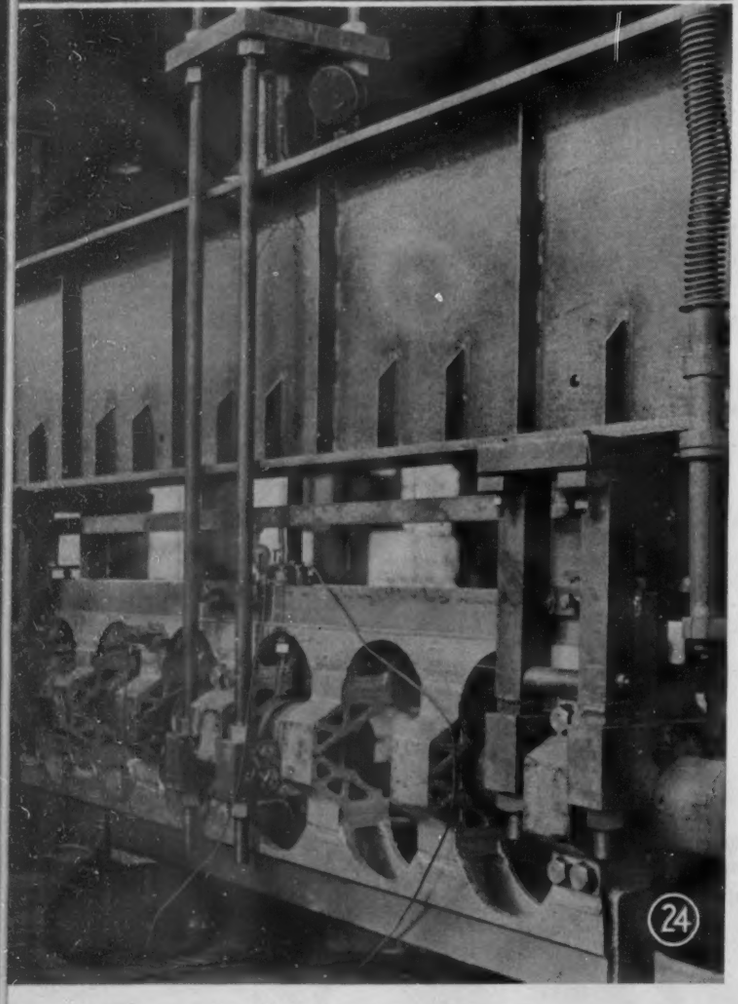
Fig. 11—Later stages on the range assembly line are shown here. Workers are wiring heating elements and attaching parts

Fig. 12—Westinghouse uses many conveyors in production and assembly work. Here, postwar electric irons are passing from final assembly and inspection and being packed for shipment

Fig. 13—Section of the electric roaster line. Westinghouse has added several new items, including food freezers, to its home appliance line

Designing WELDED

By GEORGE L. SNYDER
Chief Engineer
Lukenweld Inc. Division
Lukens Steel Co.
Coatesville, Pa.



SALIENT features of four final factors—specifications, weight control, rigidity and size limitations—should be approached with a view toward determining applicability of weldments or components for weldments designed into welded machinery parts.

Specifications: A weldment should be specified clearly and concisely so that no misunderstanding results, and to insure, from the equitable standpoint that each potential vendor is quoting on the same conditions. It is important for instance, that the weldery know if the weldment must be produced under a code requirement.

Overall tolerance requirements on various dimensions of the weldment should be considered carefully. The designer might be inclined to make everything tight to "be on the safe side." But this can be a costly practice compared to that of intelligently evaluating requirements. Often a relatively close tolerance, under given conditions of size, shape and amount of welding, at some point in a

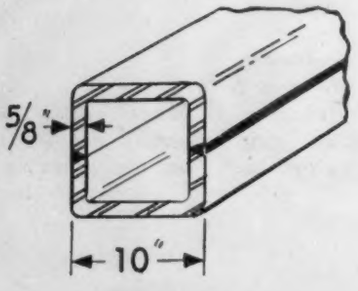
Fig. 23—Welded frame for "C" or open-side hydraulic press

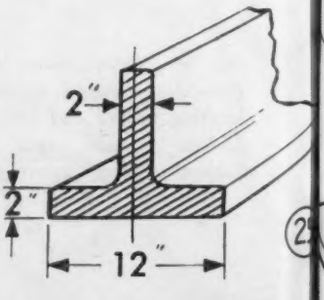
Fig. 24—Analysis on model of welded engine bed. Stresses under lateral load can be read from strain gages visible in illustration

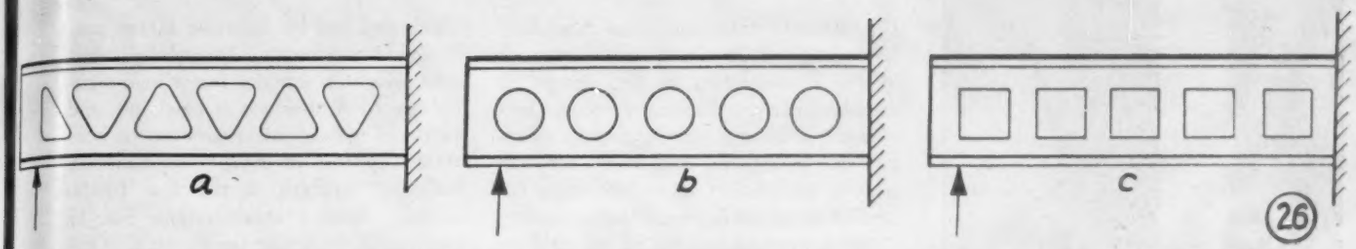
Fig. 25—Design detail of spokes in a welded machine part

Fig. 26—Cantilever beam showing three designs in web openings

Fig. 27—Comparative treatments of bolting flanges in a welded part







(26)

MACHINERY PARTS

Concluding article of this series covers four additional factors to be considered in designing for welding — specifications, weight control, ridigity and size limitations. Two preceding articles in STEEL, Feb. 4 and 11, discussed various components, methods of fabrication, and conditioning and inspection

weldment can be costly to achieve. Proper study might show that close tolerance can be lessened without affecting the service performance of the weldment. In this instance, it is common practice to consult with the weldery to achieve mutually the best conditions.

Check list of specifications and drawing information such as the following will give the weldery proper and clear directions:

Steel specification.
Inspection agency, if any.
Weld sizes and their standard.
Tolerances, general or special.
Gritblast?
Grind. If so, where?
Stress relieve?
Paint. If so, what type and how many coats?
X-ray requirements? To what code?
Test—hydrostatic. If so, at what pressure?
Test—oil tightness?

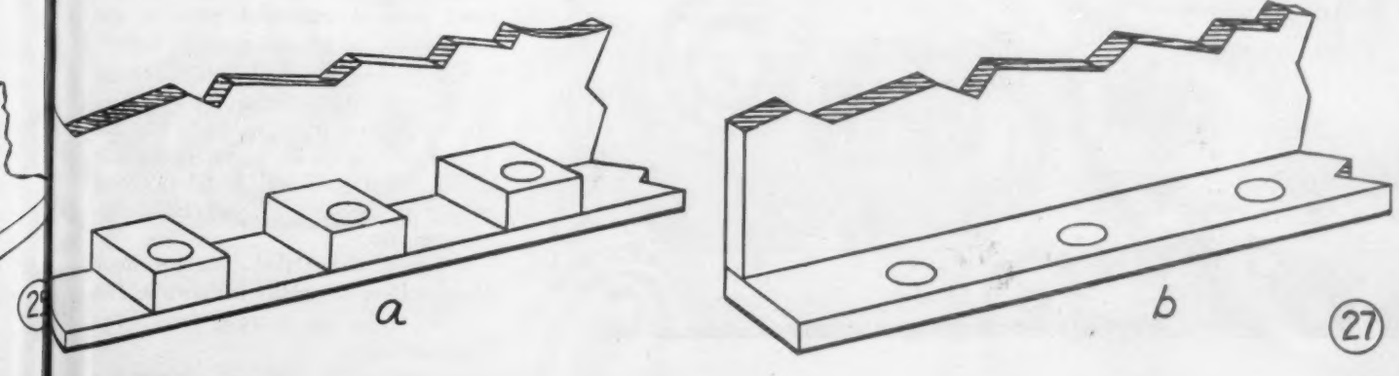
Many types of weldments or components for weldments can be designed effectively into welded machinery parts. Categorically, machinery parts as distinguished from other types of structural members, can be defined as parts required to resist or support moving forces; parts subjected to dynamic loading.

Dynamic loading or applied forces in motion can involve two additional factors or criteria—fatigue and impact. They must be considered in design of the part and the proper selection of its material. These two factors, alone or in combination, often can affect materially, or control the shape, material and manner of fabrication of a mechanical structural member.

If fatigue or impact are of major consideration, those properties of the material determining its resistance to such loading should be known. As we know, such properties generally are referred to as the endurance limit with respect to fatigue, and impact resistance with respect to impact. This latter property sometimes is related to temperature.

External contours of a part subjected to dynamic loading, particularly when fatigue is probable, are an important consideration, especially when the member is subjected to primary loads. They are extremely important at the points of changes in contour in a structure of irregular shape.

Contours influence the effectiveness of a load-carrying member from a general standpoint. Proper contour denotes efficient disposition of material which is fundamental in control of weight. As an example, the component shown in Fig. 26-a is less rigid for a given over-all weight than that shown in Fig. 26-b. Disposing metal as shown in Fig. 26-c is more effective from this standpoint. An example of such design in an existing welded structure is shown in Fig. 29. This is a C-frame for a metals shear.



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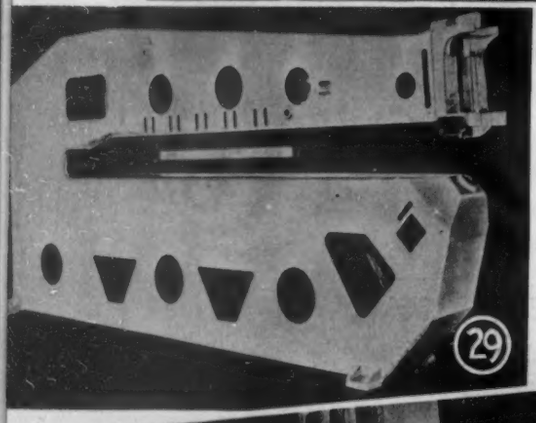
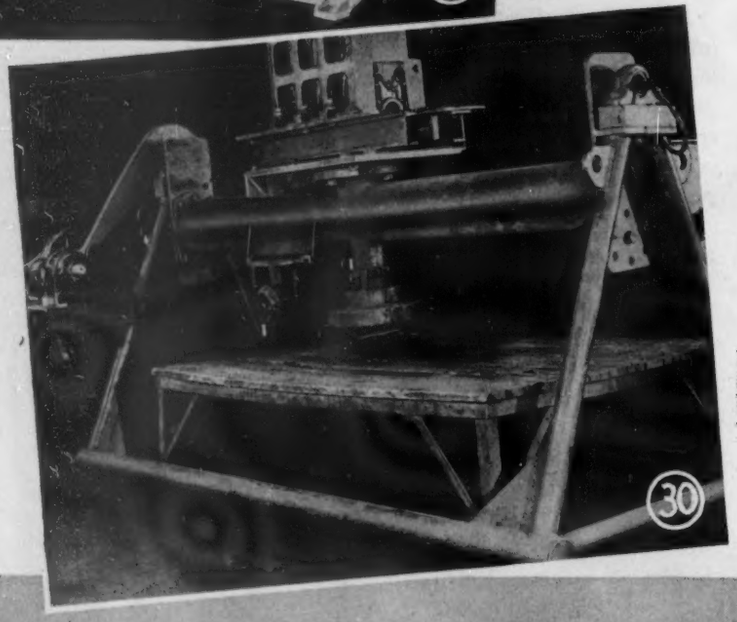
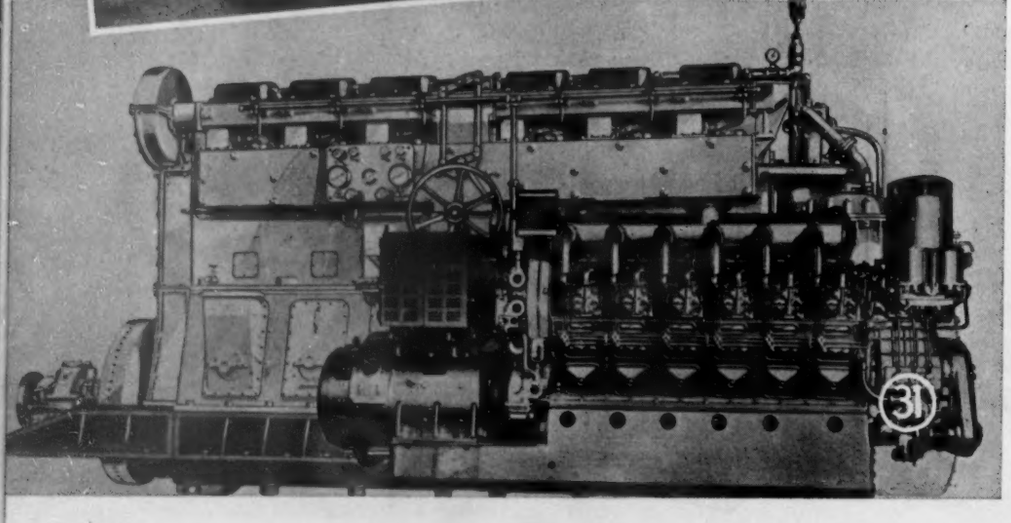






The internal contours, those bounding openings in a structure, are worthy of careful consideration in the design of machine parts. Especially, since mechanical structures usually require openings of varying sizes and shapes for such reasons as fabricating or operating accessibility, or for mechanical clearance.

Often the effectiveness of proper flowing contour, and particularly its value in rigidity, is mathematically indeterminate. Where maximum rigidity or strength for least weight is important, model analysis is possible. Fig. 24 shows the set-up for such an analysis of a welded machine part. Actual stresses in a product also can be determined by the use of instruments such as strain gages.

Weight Control: If design permits, this control can be exercised in the production of weldments. Frequently, minimum weight is a major factor in designing structural members of machines, and weight of a mechanical part can be controlled by one or more considerations. Sufficient strength is the first fundamental. Several considerations can be involved in designing for strength. One, is a properly adjusted factor of safety. A minimum factor of safety is important in designing for least weight. If it is known definitely that no internal voids can or need exist in a given cross-section subject to primary dynamic stress, one element making up the factor of safety has disappeared, or at least is under control. It is axiomatic that in designing for least weight, the shape should be as regular and flowing as possible, as previous discussion of contours revealed.

Fig. 28—Welded steel belly band hydraulic press frame

Fig. 29—Circle shear frame

Fig. 30—Application of welded tubular structure. Main beam of this welding positioner is tubular in cross section. It is subject to combined bending and torsional stresses

Fig. 31—Comparative illustration showing direct-drive 4-cycle diesel engine of 1926 with an electrically driven 2-cycle diesel engine of today

Another external consideration in the strength factor is exactness of knowledge of the magnitude, direction and location of dynamic forces with respect to each other and their reactions involved in the machine. In designing machine parts, particularly for least weight, it is important that these be predicted as closely as possible.

After this has been done, the material resisting or supporting such forces or reaction can be disposed in a weldment to best advantage consistent with mechanical clearance requirements balanced against the necessity for least weight.

Of two methods employed, one utilizing a tube and the other an "I" beam, in resisting torsional force, there is no questioning the effective disposition of metal in a tubular design. Nor is there any questioning that the effective disposition of metal insures least weight. Fig. 30 shows an example of this concept in an existing machine part.

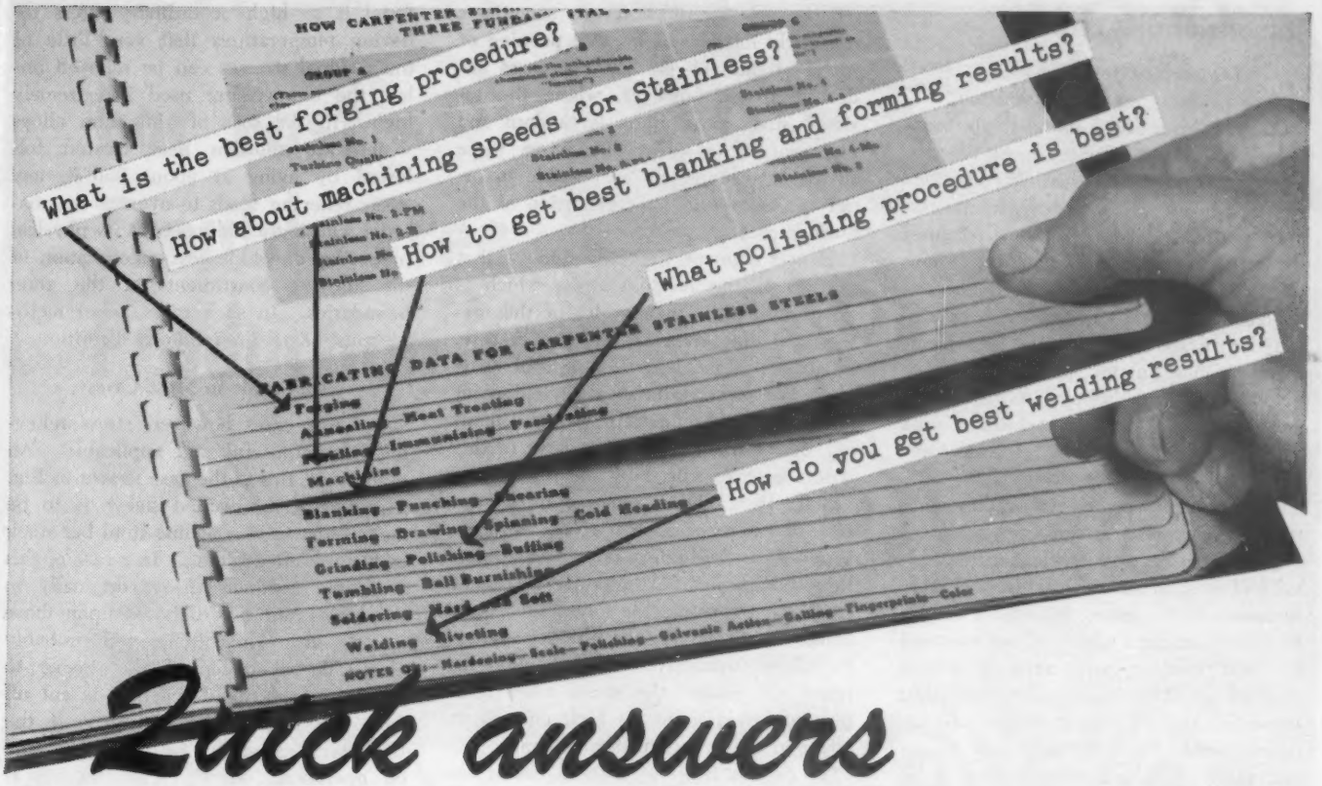
Another example of effective metal disposition is shown in the spoke, the cross-section of which is shown on the left in Fig. 25. The illustration on the right shows the spoke as it was designed initially, because of casting limitations.

Rigidity: Dominant factor in the design of structural parts for machines sometimes is rigidity, or stiffness, rather than strength as in the instances just discussed. The primary function of the spoke in Fig. 25 is maintenance of alignment between machined parts in the structure to the greatest possible degree.

Rigidity or minimum deformation dominates in the design of the "C"-type, or open side, press frame shown in Fig. 23. This weldment is composed exclusively of hot rolled plate with metal thickness at any point dictated solely by design requirements.

A welded design that embraces directional control of rigidity is shown in Fig.

(*Please turn to Page* 140)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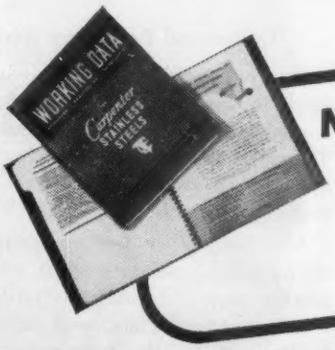

MORE answers to questions about Stainless Steel

- Heat Resisting Steels for High Temperature Service
- Stainless Steels to Combat Specific Types of Corrosion
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Dimensional Accuracy

(*Continued from Page* 91)

surface oxidation or decarburization.

Almost invariably, parts to be machined to close tolerances must be subjected to various heat treating operations which will aid in meeting the tolerances, even if the finished part is not required to be hardened. For instance, where possible, the raw material should be annealed, normalized and tempered, or subjected to a spheroidizing heat treatment, to put it in a suitable condition for easy machining. In addition, parts to be subjected to considerable machining, such as those to be hogged out of large forgings or bar stock, should be given one and, in some cases, several intermediate stress relief heat treatments.

Stress relief is an important metallurgical tool in insuring dimensional accuracy, inasmuch as machining introduces residual stresses in parts which, if not removed by heat treating, will tend to relieve themselves at least partially, and thus cause the finished part to distort. In addition, residual stresses may exist in the raw material, which were induced from cold straightening or from thermal differentials caused by cooling from previous heat treatment, forging, rolling, welding or casting.

It is true that certain types of residual stresses are useful, and are sometimes purposely introduced by shot peening or surface treatment, etc. In the cases under discussion however, where the residual stress distribution is random and unknown, it is safest to remove these stresses as completely as possible in order to insure minimum distortion of the finished part.

Heat treatment can only remove that portion of the residual stress which is greater than the yield point of the material at the stress relief temperature, regardless of the length of time of heating. For most materials the yield point decreases with temperature in the manner shown in Fig. 1, and a curve of this type therefore will show the highest residual stress which remains in a part after stress relief at any given temperature. Thus the highest possible temperature should be used, and the treatment carried out for only the minimum length of time necessary for the residual stresses to relieve themselves at that temperature. Of course, the stress relief temperature should not be high enough to affect any previous heat treatment.

In certain types of material stress relieving heat treatments present difficulties or may be inapplicable. In the case of austenitic heat resisting materials, or any materials which are strong at high temperatures, the yield point of the material is so high at ordinary stress relieving temperatures that very little of the residual stresses can be relieved unless the temperature used is extremely high. In the case of aluminum alloys which are solution heat treated followed by aging at about 350°F, any stress relieving tends to overage the material, causing a reduction in its physical properties due to excess precipitation of the alloying constituents at the grain boundaries. In such cases, other methods must be used to minimize distortion.

Applicable in Most Cases

In most cases however, stress relieving is very useful and applicable. An example of this is the case shown in Fig. 2. where a thin-walled sleeve is to be made on a screw machine from bar stock or heavy-walled tubing. In a case of this type, the residual stresses originally in the bar, when superimposed upon those introduced by machining, will probably cause the diameter of the sleeve to spring out of round when it is cut off from the rest of the bar, even if the diameter was perfect before the cutting-off operation. However, if the bar is completely stress relieved before machining is started, it is possible that the machining stresses may not be sufficient to cause the part to distort enough to exceed the tolerance requirements.

If a large amount of machining is involved, this will probably not be true; in this case it will be necessary to rough machine the rings, leaving stock all over, cut them off, completely stress relieve the individual rings, and then finish them to size with another machine operation.

Typical processing and heat treating setups which have been found suitable for various types of materials are briefly summarized as follows:

Carbon and Low Alloy Steels

(A) For Machine Parts: Purchase the stock in any convenient condition, and normalize and temper before machining. Then rough machine, leaving about 0.060-in. all over, and heat treat for the required physicals.

Machine further, leaving about 0.030-in. on a side, and then stress relieve by placing parts in furnace so that they are evenly distributed and well exposed for heating. Raise the temperature slowly and uniformly to about 1175-1200°F but never higher than 50°F below the tempering temperature in a neutral atmosphere. The furnace should be pyrometer controlled, and the temperature should be held for about 60 min after it has soaked through the parts, and then slowly reduced (about 150°F per hr) down to about 200°F, after which the parts may be removed from the furnace and cooled in still air.

SELF-DUMPER: Loops welded to a steel tote box with special hinged bottom are engaged by hooks on top of movable uprights of a fork-lift truck to automatically unload contents without manual handling. As truck forks are lowered, bottom of the box falls away, dumping metal parts into tumbling barrel. The system, enabling operators to trip loads at predetermined heights, was developed under direction of Harold Milz, chief engineer for Mercury Mfg. Co., Chicago, maker of fork trucks

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GRAPHITIC STEELS

WAR'S END: Reappearance of stainless steel and other metal kitchen tools signalizes more effectively than most items proscribed by WPB the real war's end for civilians. These utensils made by Ekco Products Co., Chicago, and recently exhibited at a display for dealers, combine three metals —stainless steel, copper and chromium. Stalks have domed ferrules forged in a solid piece from the stalk for tightness

Finish machine to size after stress relief.

(B) For Induction Hardened Parts: The same treatment may be applied to induction hardened parts, and if properly stress relieved, induction hardening can be carried out after finish machining, with no danger of distortion.

(C) For Nitrided Parts: Nitralloy should generally be purchased in the heat treated condition, since satisfactory nitriding can only be performed on material which is in a sorbitic condition with no free ferrite present, as obtained by quenching from 1700°F and tempering at about 1200°F.

Since nitralloy parts tend to grow during the nitriding cycle, it is particularly important to adequately stress relieve them so that no distortion is superimposed on their growth during the nitriding operation. In general, this can only be accomplished by a double stress relieving operation, since the stresses must be completely relieved or the parts will distort enough so that any attempt to straighten them by a finish machining operation will completely remove the nitrided layer.

This situation cannot be solved by moved by finish grinding. Outside diameter can be finish machined before nitriding, or left about 0.001-in. undersize, as the growth will provide stock for finish grinding to size after nitridin.

Generally, the parts should be machined to within 0.060-in. finished size all over, and then stress relieved at 1150°F for 2 hr. This treatment should be carried out in a neutral or slightly reducing atmosphere, and both the heating and cooling cycles should be performed slowly and gradually. Following this treatment, the parts should be machined further, leaving about 0.030-in. on a side, and stress relieved again in the same manner, after which they can be machined to the dimensions required for nitriding.

These dimensions must be carefully worked out to take account of the growth during nitriding so that only a small amount of finish grinding is required after hardening. For instance, on a part such as the sleeve shown in Fig. 3, the inside diameter may grow about 0.004-in. and the outside diameter about 0.006-in. during a 72-hr nitriding cycle at 975°F. This growth, by the way, should be accurately determined by preliminary tests on any given type of part, and will be constant thereafter provided the same processing is always followed. The bore therefore, must be left about 0.008-in. undersize before nitriding, in order to compensate for the 0.004-in. growth, and still leave 0.002-in. on a side to be removed by finish grinding. Outside diameter can be finish machined before nitriding, or left about 0.001-in. undersize, as the growth will provide stock for finish grinding to size after nitriding.

Surfaces to be protected from nitriding should be tin plated. However, the depth of plating should be no more than 0.003-in. since the tin must adhere by surface tension during the nitriding operation. If the tinning is to be removed after nitriding it should be done by grinding to a depth of 0.002 to 0.003-in. below the surface of the tin. Only those surfaces should be tinned on which hardening would actually be detrimental, because of the danger of the tin running on to some of the surfaces to be hardened, causing soft spots.

The actual nitriding operation should be carried out for a long enough time to give the depth of penetration desired; 48 hr at 975°F gives about 0.015-in. penetration. After nitriding, at least 0.0015-in., but not more than 0.0025-in. should be ground from the nitrided surface in order to get down to the hardest layer, which is just below the surface, as shown in Fig. 4.

When two opposite surfaces of a part have been nitrided, the amount of grinding on each surface should be the same.

Austenitic Heat Resisting Steels

As heretofore explained, the stress relieving temperature for these parts must be very high, and stress relieving is therefore used only when absolutely necessary, such as to reduce stresses induced during fabrication of parts by welding.

Care must be taken to load the parts in the furnace in such a manner as to prevent sagging. The initial furnace temperature may be 600°F, and the temperature should be raised slowly to 1800°F and held for about 30-60 min after the heat has soaked uniformly through the parts, depending on the section thickness. The parts should then be slowly cooled in the furnace, down to about 600°F, after which they may be removed from the furnace and cooled

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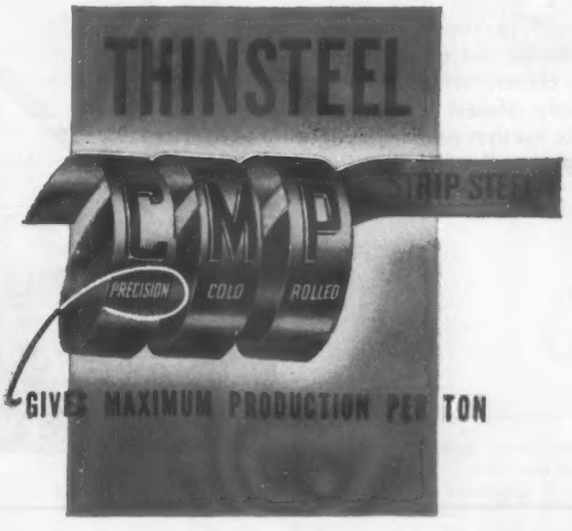

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in still air. In analyses prone to the formation of sigma phase, however, the heating and cooling rates through the critical temperature range must be rapid.

In all cases, these parts should be rough-machined first, followed by the stress relief, and then finish machined. In the case of weldments, the stress relief should follow immediately after the welding, before further machining, and a second stress relief may be required if considerable machining still remains to be done.

Cast Gray Irons

Stress relief of gray iron castings can generally be carried out prior to any machining operation, although in rare cases it may be necessary to first remove the casting skin.

The parts should be carefully loaded and supported in the furnace to prevent warping or sagging, and heated in a neutral atmosphere. The temperature should be raised slowly to 950-1000°F. In the case of heavy sectioned castings, or in castings where there is a sharp change of section, the temperature should be raised and held at 600°F and then at 800°F before raising to the final temperature. At each level, the temperature should be held long enough to completely soak through the parts.

Aluminum and Aluminum Alloys

Unheat-treated aluminum parts, generally can be stress relieved before machining except in the case of castings, which may require a preliminary skin cut. A temperature of 450°F should be used, holding for about 30 min, and the furnace temperature should be raised slowly, and preferably cooled slowly, although a still air cool may be used.

Heat treated aluminum parts can not usually be stress relieved due to the tendency toward overaging previously discussed. However, the residual stress level can be reduced to a minimum by proper solution heat treatment followed by quenching in boiling water instead of cold water. The temperature of the quench water must not be below 200°F.

The amount by which the residual stresses can be reduced by this treatment is shown in Fig. 5, and a boiling water quench will therefore provide comparatively stress-free material to begin with, without the necessity for further stress relieving during machining, provided care is taken to use sharp tools and light cuts in order to minimize machining stresses.

The boiling water quench will result in slightly lowered physical properties, about 5000 psi, as shown in the table, but this reduction is generally of minor importance in comparison with the minimizing of the residual stresses. Physical properties of one type are:

TYPICAL PHYSICAL PROPERTIES OF 14ST ALUMINUM

	Cold Water Quench	Boiling Water Quench
Tensile Strength	65,000 psi	60,000
Yield Strength a 0.02% offset	50,000 psi	45,000
Elongation per cent in 2 in.	10	10
Brinell Hardness	125	110

Magnesium Alloys

Magnesium alloys are not as sensitive to overaging as aluminum alloys, and may be stress relieved if necessary, although parts which have been properly heat treated and aged will not usually be subject to much distortion unless excessive stresses are induced in the machining operations.

If stress relief is desired, it should be performed after rough machining to within 0.030 to 0.060-in. of finished size. A temperature of about 400°F should be used, holding for 5 hr, and followed by slow cooling.

Conclusions

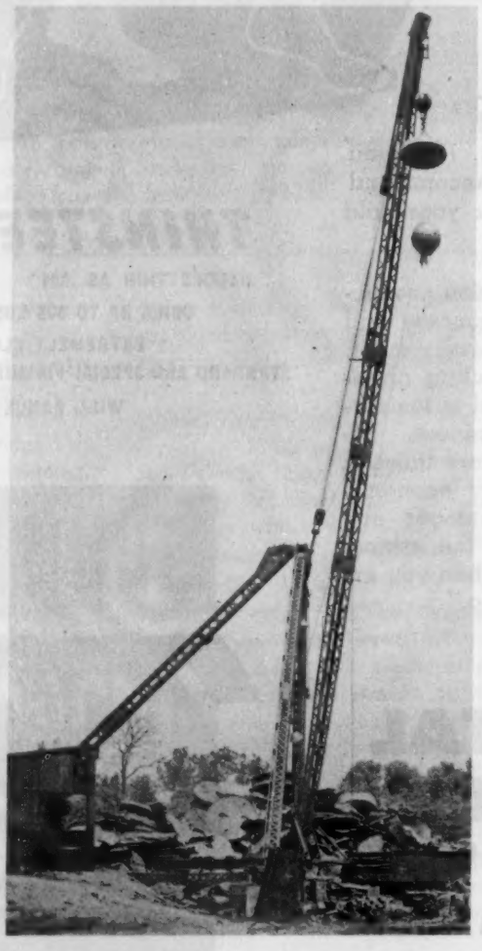
In all stress relieving operations it is important to properly support the parts in the furnace, and to raise and lower the temperature slowly and uniformly in order that no stresses be introduced during the heat treating cycle due to uneven temperature differentials.

The heat treating cycles outlined are the outcome of considerable research and testing, and have been found successful in the writer's experience. They have been found to eliminate distortion and make close dimensional control possible on difficult machining jobs which were otherwise properly designed and processed. The metallurgical aspects of this problem are, of course, just one phase of a group of factors which must be closely co-ordinated.

It should be further realized that specific treatments may vary with the particular part and with the conditions in the particular shop. The basic fundamentals always hold true, however, and only require suitable application to the particular problem in hand.

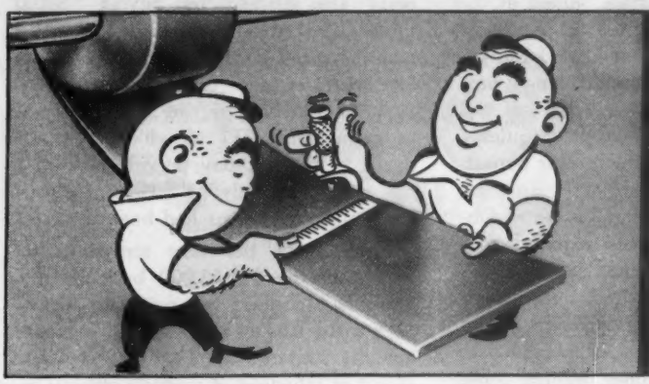
—o—

Improvement in designs of airplanes and other machines may result from tests recently completed on new pressure welding processes of alloy steels, according to Civilian Production Administration. CPA's research division has released test data in a 217-page report.



"SKULL CRACKER": In the operation shown — breaking large pieces of steel scrap into cupola size for Sheffield Steel Corp., Kansas City, Mo. — a 6-ton "skull cracker" ball has just been released by the derrick's magnet from 96-ft height to come crashing down on old gondola car at center. (Photographer wisely refused to wait and take his shot at moment of impact. Said he, "Too much shrapnel")

INSIDE STORY OF BUNDYWELD



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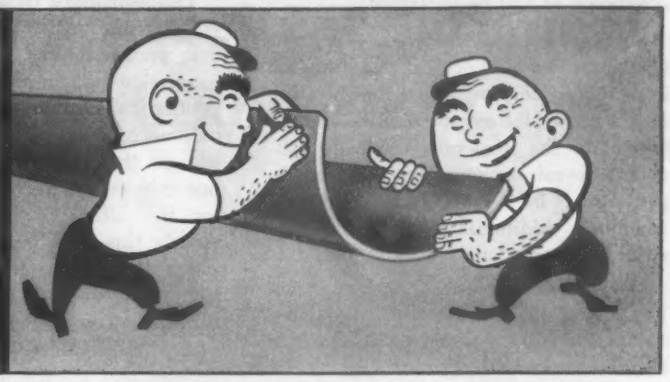
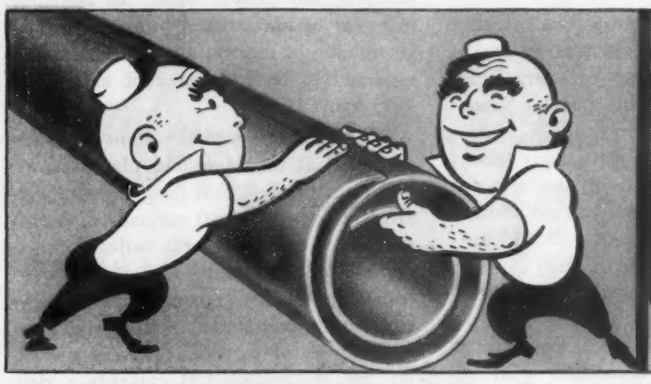
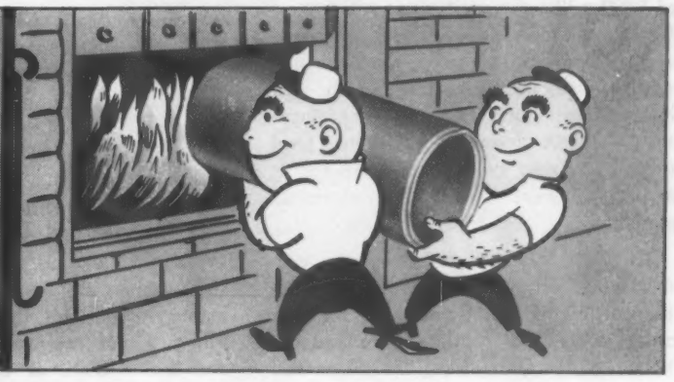


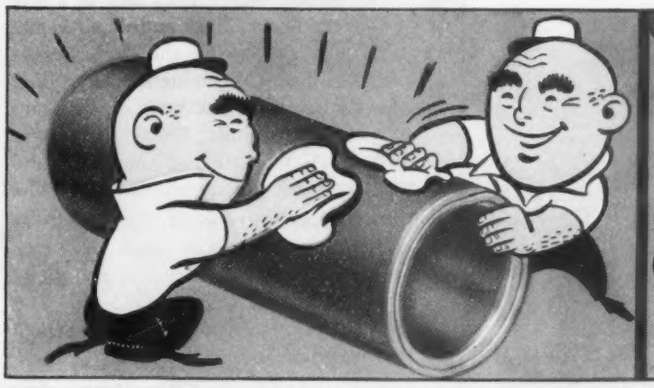
2 . . . of copper-coated S.A.E. 1010 steel is *continuously* rolled twice around *laterally* into tubular form. Walls of uniform thickness and concentricity . . .



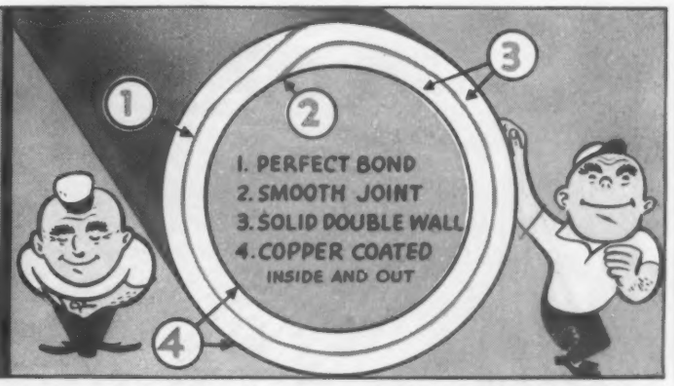
3 . . . are assured by the use of close tolerance cold rolled strip. This double rolled strip in tubular form is next passed through . . .



4 . . . a brazing furnace, where the copper coating fuses and alloys with the double steel walls. After brazing and cooling, the tubing has become . . .



5 . . . A SOLID double wall steel tube completely copper brazed throughout 360° of wall contact, copper coated inside and out, free from scale and closely held to dimensions.



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Reconversion

(*Continued from Page 99*)

expanded program at a figure 50 per cent above this, both programs being dovetailed as will be explained.

Shortage of many materials is restricting output on all lines but the situation is reportedly improving daily. The story of this successful reconversion in 90 days instead of the 6 months originally estimated, reveals an amazingly efficient organization. In view of the problems encountered, additional details of the job and how it was done are warranted.

Output Increased 50 Per Cent: On July 25, 1945, the company announced an $11,500,000 expansion program for its Electric Appliance Division which includes both the Mansfield plant and a second plant at East Springfield, Mass. At that time, a dollar volume in excess of $100 million annually was anticipated from increased sale of the 23 different appliances marketed before the war, plus newly developed products which will include home and farm freezers, automatic clothes dryers, steam irons, food mixers and new types of vacuum cleaners, in addition to 23 other electrical appliances.

Of this total, $6,500,000 was earmarked for the Mansfield plant. Largest portion of this figure goes for machine tools and capital equipment — about $3,100,000. New buildings and additions to existing units will cost approximately $2,153,000 at Mansfield with another $1,300,000 for plant rearrangements, including cost of conveyors, jigs, fixtures and the like.

This expansion program, aimed at increasing the plant output 50 per cent over prewar figures, complicated the reconversion job. In planning the new production lines after V-J day, it was not only necessary to get them going quickly and get them back up to prewar output, but this had to be done while planning for the ultimate greater output. Obviously this dual purpose required considerable foresight in the layout of departments, feeder lines and main assembly lines. Too, in purchasing new equipment, it demanded careful planning to be sure that the machines ordered could be obtainable immediately, yet had sufficient capacity to fit into the ultimate picture.

Dummy Board Layouts: One of the first steps in reconversion was to make up dummy board layouts of every floor of each building in the plant. Since present plant facilities include 16 buildings with 1,372,720 sq ft of floor space located on a 31.5 acre tract, this was no small job. New buildings and additional floors on present structures will add another 400,000 sq ft of floor area.

In making up the layouts, it was necessary to plan for the ultimate goal of 150 per cent prewar output, dovetailing the intermediate or immediate goal of 100 per cent prewar into this $6,500,000 expansion program.

Some idea of the purchasing problem involved can be had from the fact that in a normal year, requirements of the plant are satisfied by buying 75-100 pieces of new equipment over the 12-month period. Contrast this with the 771 items of new equipment and conveyors authorized by the new expansion program, some 717 of which were ordered in the 120-day period starting in the middle of July. By the middle of November, 307 items had been received.

Ground for the new structures involved in the $2,153,000 building program at Mansfield was originally scheduled to be broken Dec. 1, but work was actually started Nov. 12, about 3 weeks ahead of schedule. Company officials estimate that when expansion is completed, the plant will employ 7000 workers instead of the prewar 5000. In the first full year of unrestricted production, dollar volume of electric appliance sales are expected to be 138 per cent above the 1941 figure.

Some idea of the total volume of goods produced at the Mansfield plant can be had from the fact that prewar operations involved receipt of 40 carloads of material and shipment of 60 carloads, each day. The plant had some 13 miles of conveyors. When reconversion and expansion are completed, each day will see 60 carloads of material come in and 90 go out, a total of 150 carloads a day. And 20 miles of conveyors will be in operation.

The Double Shift: Let's look at a few typical production lines and departments to see what this double shift from peacetime goods, to war production, to civilian goods involved in the way of changing actual plant layout. Every effort was made to utilize existing conveyors and processing equipment wherever possible.

Conveyors are one of the key items in a mass production plant like this, points out Mr. VanDerau. Same group of key men that conveyorized the plant in 1924 are responsible for the excellent reconversion showing, he adds.

The range line as it was set up before the war and as it now is arranged is diagrammed in the simplified schematic, Fig. 1. It consists of a main conveyor with feeder lines at right angles.

For war production, this same area was utilized in making P-47 assemblies as shown in Fig. 1. Reconversion here consisted of setting up the original line with provision for the 50 per cent ultimate expansion at as many points as immediately possible.

Electric Range Line: Range production starts in the press department, first floor of E building, where 0.044-in. enameling stock is blanked out for the

BOLTLESS: Jointless rails ¼-mile long, made from standard lengths by oxy-acetylene pressure-welding, are shown ready for the 5-mile long Hoosac Tunnel on the Boston & Maine railroad, near North Adams, Mass. Rails are clamped in welding machine with ends butted squarely together. Blowpipes heat metal at joint to correct temperature, and pressure forces semiplastic ends togther, forming a weld stronger than the rail itself

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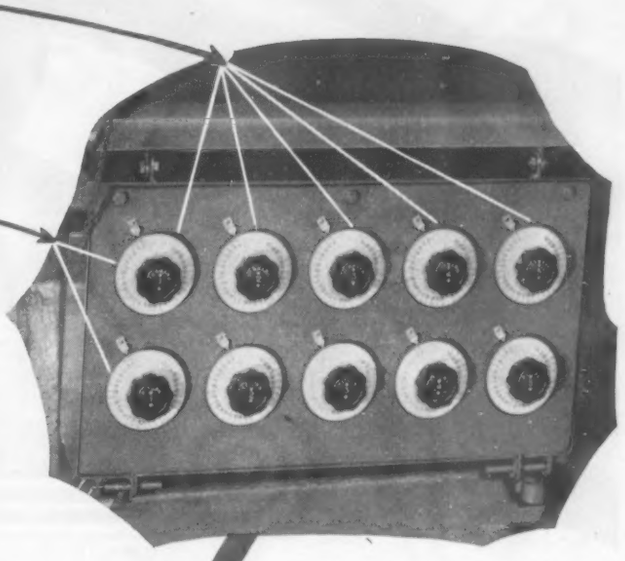

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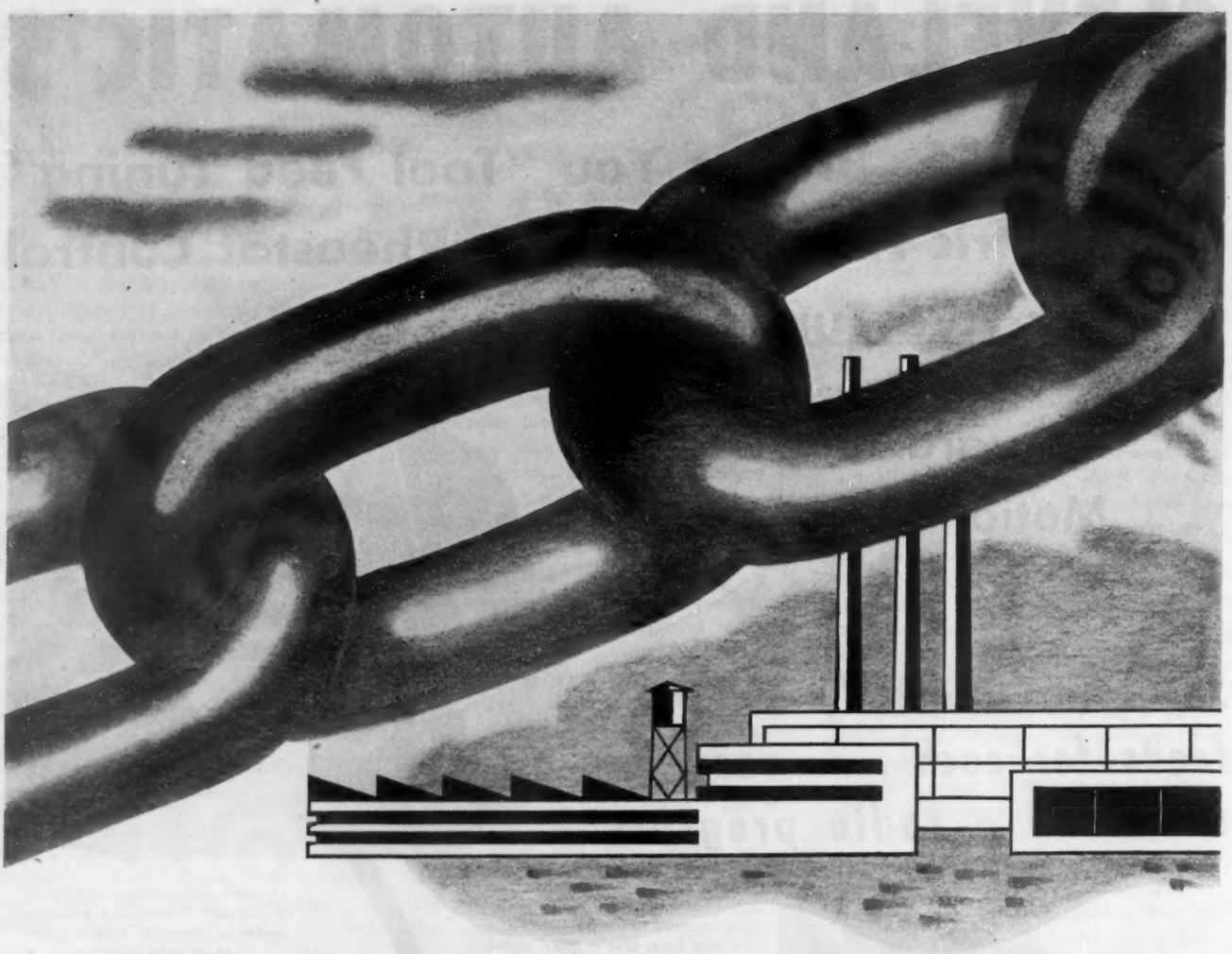

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range body. It comes up to the third floor of E building in the flat, measuring about 92 in. long, 28 in. wide. First step in fabrication is to form the flanges at top and bottom (along long side of sheet) in a 12-ft Cincinnati press brake. Then ends are hand formed in a fixture, producing a "U" measuring approximately 40 in. along the top with 26-in. sections at each end.

Toe channels are also flanged and formed to correspond to openings in the main body section. Reinforcing angles are spot welded to other sections to form subassemblies. Body, toe and subassemblies are then all clamped in one fixture and joined, using 35-kva portable spot welding guns, three operators working simultaneously in each fixture, several fixtures being employed on the line.

Gas welding corner notches at another station then completes the main structure. Certain other portions are also gas welded where strain might cause chipping of the porcelain enamel, or the enameling temperature might result in an undesirable amount of distortion.

Body then is cleaned and sent to vitreous enameling plant. Received back, it goes onto assembly line, has cover panels and top placed, oven section added, followed by heating units, controls and wiring. Units go right on down main line for testing and packing for shipment.

Electric Refrigerator Line: Refrigerator production line on second floor of E building is arranged as shown in Fig. 2, covering quite a large area. For war work, this area was utilized for the production of insecticide dispensers, a good portion of the conveyor lines being readily adapted for this work as shown in Fig. 2. Now lines are back to prewar arrangements but with enlarged facilities for increased production.

Refrigerator production starts in fabricating area as in Fig. 2. Outer frame or shell is made by blanking out a large section from stock 0.044-in. thick then flanging it along both sides to make the opening for the back panel and front door in the completed part. This flange is really a double or return type with three thicknesses of metal through a good portion of it.

Next step is to form this flat into a large "U" to produce the sides and top of the refrigerator shell, done by bending at two points in a huge bulldozer equipped with special forming dies or wings that "wrap" the sheet around the main die. The operation is done so precisely that absolutely no wrinkles are produced in the double flange even though it is upset considerably in taking the required shape.

Multiple Automatic Spot Welding: Next, a back sheet or panel is spot welded across the back opening of the shell by placing it in a fixture in a special multiple automatic spot welding machine which proceeds to make 126 welds in a matter of a few seconds. Welds are made at six points simultaneously, using three different welding transformers, the arrangement being for the welding current to travel through the work to a heavy copper backup plate and back up through the work at another point. Thus each transformer makes two welds simultaneously. With three transformers, six welds are completed at a time.

As these first six are made, the welding tips for the next six move down against the work. Then these six welds are made, and the next six tips move down.

Tips are thus moved down in groups and the welding current switched from group to group in rapid succession, 18-20 sec being sufficient for the entire cycle required in welding at 126 different points around the circumference of the back sheet.

Most of these welds are through two thicknesses of 0.040-in. material, while some are through 0.040 plus 0.062-in. stock, this heavier material being employed for the back rail. Each of the three transformers has a separate heat control so these different thicknesses can be handled without difficulty. About 400 lb pressure is exerted on the work by each contact point.

Largest sheet welded in this manner is 32¼ x 63⅝ in. Production is at the rate of about 80 units per hour. While the overlapping joint thus produced is not air tight, it is easily made so by application of calking compound.

Completing Frame Structure: Now the U-shaped outer frame with the back panel welded in place goes into a special fixture known as a sizing buck. In this fixture, the following items are clamped in place and spot welded by means of portable resistance welding guns:

—four door corner reinforcements
—door latch
—front rail
—toe plate.

In addition, the bottom edge of both sides is flanged in this fixture by means of auxiliary rollers operated by hand. The fixture, besides holding these parts in correct position for attachment, sizes the entire frame assembly to within extremely close limits, thus greatly facilitating proper fitup when attaching the door, seals, trim, etc.

Assembly of Refrigerators: After fabrication of the main outer frame, units go down an overhead chain conveyor, Fig. 2, to cleaning, bonderizing and painting departments for application of a

INSPECTS MOVING OBJECTS: Machine parts moving at standard conveyor speeds on the belt of this new x-ray tool devised by North American Philips Co. Inc., New York, can be viewed by inspectors from either side of the instrument through its direct fluoroscopic head. Defective pieces are marked without stopping conveyor. Power supply is 230 v, 50-60 cycles

PAINTED FOR JONES & LAUGHLIN STEEL CORPORATION BY ORISON MAC PHERSON

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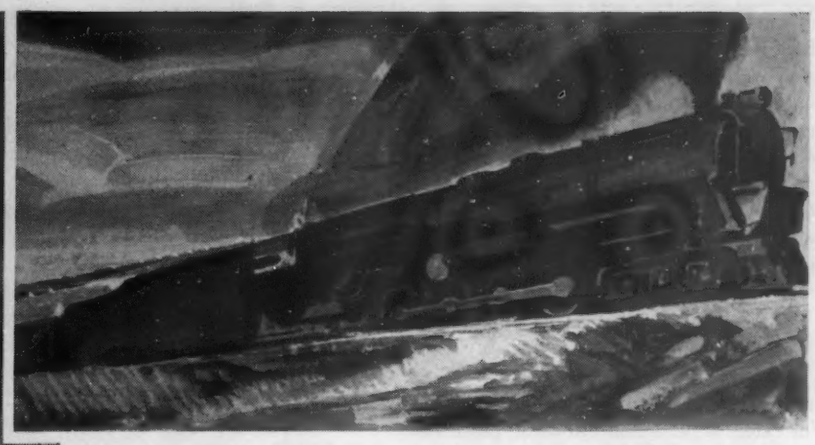

YOU COULDN'T SHIP MUCH FREIGHT OR SHIP IT FAR OR FAST— WITHOUT STEEL

Without steel you might still be shipping your goods in canal boats or covered wagons or by means of the little iron locomotives with the big stacks that labored to pull short trains of small wooden freight cars, and were often stalled by winter storms.

But, today, great, powerful steel locomotives are the shuttles that weave this continent into a nation. They pull long trains of big steel freight cars on heavy rails over mountains and plains, across bridges, through tunnels, up elevated approaches, and into vast freight terminals, and come in on time, no matter what the weather.

This high-speed merchandise freight service is a result of cooperation between the railroads and the steel manufacturers in development through research of better steels. One of these is Otiscoloy, a lighter, stronger J&L steel with which rail carriers can reduce weight of cars and increase pay loads. The many steels developed for every phase of railroading will enable more freight to be transported far and fast with security and dispatch.

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STEEL CORPORATION

RAIL FREIGHT

500-ton steel horse, the new gear drive, turbine locomotive of The Pennsylvania Railroad (see sketch), is a great advance from the days of the little "iron horse" of the last century. With rated capacity of 6,900 horsepower at the turbine shaft, this new Baldwin-Westinghouse built locomotive, covering 123 feet of track, will be able to maintain fast and heavy freight and passenger train schedules, smoothly, with less wear on the steel rails.

116½ million tons iron ore hauled by Great Northern in 4½ war years is all-time high.

Interchangeable locomotives, steel constructed, steam, electric or Diesel powered, that can haul heavy fast freight trains one day and crack passenger trains the next, save operating time and money.

1st iron rails made in U.S. were rolled in Scranton, Pa., century ago, for Erie R.R.

On the Santa Fé, 5400 h.p. Diesels provide ample power to handle heavy freight trains over mountain grades. A fleet of 80 of them is now in operation.

A-B air brakes for control of long freight trains were brought into general use in 1933.

The new B&O Mallets, big, steam locomotives that mean faster schedules and haulage of greater tonnage, are 125 feet, 3⅝ inches long, weigh 1,010,700 pounds, have a 115,000 pound tractive force.

Sails for railroad power were tried unsuccessfully by first officials of B&O in 1820's.

N. Y. Central's 26 giant "Niagaras," new, 6,000 h.p., coal-burning locomotives for high-speed freight or passenger service, bring their locomotive fleet up to 3650.

Getting the "highball" is a phrase that originated in pioneer railroading days when the signal of a clear track ahead was a white ball hoisted to the top of a tall pole.

Phones on rolling trains are a creation of Pennsylvania Railroad research worked out with Union Switch and Signal Co. Locomotive engineer in cab, conductor in caboose, towerman in signal tower and crew of passing train may communicate with each other.

1,773,049 freight cars in 1944 were in service on Class I railways.

"Big Boy," Union Pacific's new, powerful steam locomotive, designed to haul heavy loads on mountain grades, is 132 ft. 9⅞ in. long, weighs 1,197,800 lbs. Tractive effort is 135,375 lbs., max. speed 80 m.p.h., 70 m.p.h. continuous speed.

Lighter steel freight cars constructed of Otiscoloy are being turned out by car builders for railroads interested in reduction in weight up to 25%, and increase in pay load. Otiscoloy is a high-tensile steel, created and produced by the Jones & Laughlin Steel Corporation. Otiscoloy resists corrosion, withstands abrasion and possesses a high degree of weldability.

high quality Duco finish. Transferred to a roller conveyor, the units then travel down the main assembly line where the procelain enameled food compartment is put in place, insulation packed in between compartment and outer shell, refrigeration unit and controls added, door and trim put in place, inspected and packed for shipment.

As indicated in Fig. 2, additional feeder lines for refrigeration units, door assemblies, etc. at right angles to the main assembly line conveyor are used in building up these subassemblies.

Porcelain Enamel Plant: Food compartments, outer panels for electric ranges, parts for laundry equipment and similar items are fabricated and porcelain enameled in a separate plant. Fig. 3 is a simplified schematic showing arrangement of department and principal units in this plant. Built at some distance from the main plant, trucking of parts to and from the enameling plant was eliminated in 1940 by construction of one of the largest industrial bridges in the country. Over 1000 ft long, it has two chain conveyor lines and a roller conveyor line plus passageway for pedestrians and trucks.

Plant consists of three main sections or bays. West unit was built in 1941 to house expanded facilities but this expansion was stopped by Pearl Harbor. During the war it housed cleaning, anodizing and heat treating facilities for aluminum aircraft assemblies. Two enameling furnaces are to go in here—one for undercoat, one for finish coat. One furnace is already in, with an extensive overhead continuous chain drying oven that leaves floor space available for other equipment. Anodizing tanks will be changed to handle pickling work.

Central section contains press room and pickling department. All sheet steel for external parts that are to be porcelain enameled is stamped and fabricated in this department, kept directly under the supervision of the enameling department and completely separated from other stamping operations in the main plant. Company officials explain this helps greatly in raising the quality of enamelware as it automatically places the entire fabrication and enameling under a single responsibility.

Enamel Plant Conversion: During the war, this press department was changed over to work aluminum instead of steel. In this way all aluminum stamping and fabrication was kept separate from steel, as steel chips or particles can easily become embedded in the comparatively soft aluminum and subsequently corrode to cause defective parts.

New equipment added to handle aluminum working including a Cecostamp and a hydraulic press for forming operations, and two routers for cutting irregular outlines rapidly.

Reconversion here is quite simple, involving only the return to new steel forming dies and arranging production for the special items to be porcelain enameled.

Pickling department was not utilized during the war, but now is in full swing again. This section contains one of the largest full automatic overhead-arm-type-conveyor machines in existence. It handles an enormous amount of work.

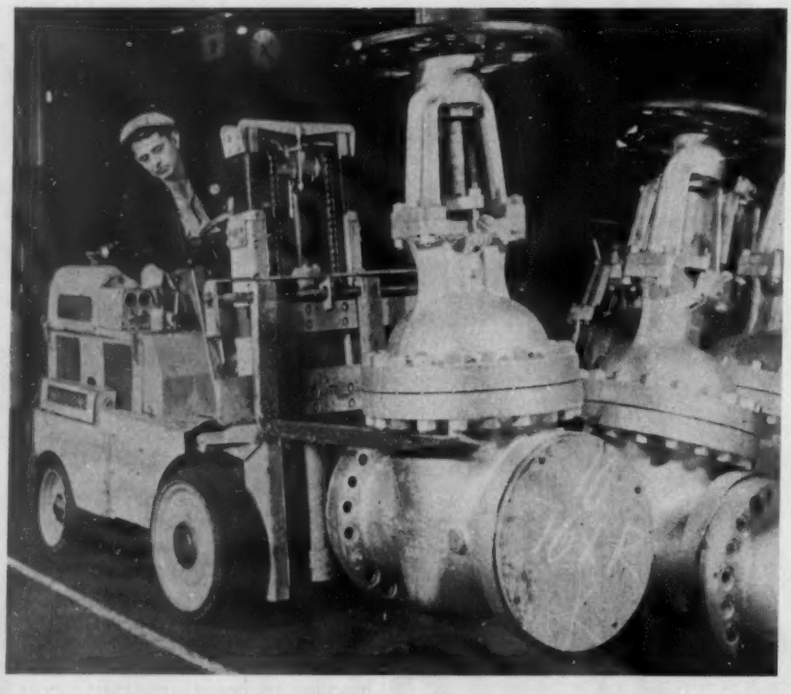
Enameling Furnace Lines: East wing or section of this plant, Fig. 3, contains two large enameling furnaces, costing over $50,000 each. Enameling here involves two coats. Undercoat or ground coat is applied by spraying large items, dipping small ones. After drying, edges receive additional enamel for reinforcing. Parts then go through ground coat oven where enamel is flowed on the work, this oven being gas fired by nine burners in a 50-ft burning zone at the far end of the hairpin type conveyor path through the furnace. See Fig. 3. Firing temperature is 1540-1560° F. Furnace conveyor is roughly 144 ft long from end to end, furnace itself being 88 ft long.

Ware takes 20 min to travel the ground coat conveyor circuit, 4½ min of which are spent in the firing zone.

From the ground coat unit, parts go into a storage area between this and the finish coat furnace, a slightly larger unit than the ground coat furnace. At extreme east side of plant, finish coat furnace has a 60-ft burning zone and is 93 ft long. Conveyor chain travels somewhat faster here, making the extended circuit in the same time as the ground coat unit—20 min. Ware is in firing zone 3½-4 min. The continuous conveyor then carries work through a cooling area and on to a special tunnel with high intensity indirect lighting for color matching. Here finished parts are matched against standards and given a number indicating into which color group they fit.

During the war, enamel furnaces were not utilized. The spray booths, however, were employed for application of zinc chromate primer to aircraft parts.

Color Matching: This classifying of enalmeware is extremely important. All panels covering an electric range, for instance, must be of the same color or otherwise the range would not have a good appearance. Since there are many hundreds of shades of colors, parts enam-



HEAVY HANDLING: Large valves produced in plant of Crane Co., Chicago, are easily handled by special attachments and fork truck manufactured by Clark Tructractor Co., Battle Creek, Mich. A fleet of such trucks handle entire range of valve sizes, stowing the smaller ones on simple pallets for loading and shipment

With steel supplies still unbalanced and future supplies still uncertain, busy men trying to do a production job are aided or hampered in their work by the support they receive from their warehouse sources of supply.

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COLD TESTING: Piece of rubber tubing is being removed from a refrigerator by operator clad in electrically heated suit in new cold room at B. F. Goodrich Co., Akron, O. Temperatures range from minus 90 to plus 50° F, and rubber and synthetic rubber compounds, plastics and other materials are tested. Room has five working units, each 6 ft square, cooled by compressors using Freon 12 and 22 as refrigerants. Each unit operates separately, with electrically controlled temperatures charted for a 24-hr study at different levels

eled in white for instance are grouped into the various shades of white.

This color classifying against standard samples is done in the special light tunnel mentioned above. Another conveyor then carries enamelware on down to a large storage area. This storage must have high capacity for in it must be accumulated a large stock of many different parts. Parts are enameled in runs of a single part. But all different panels for a range are sent to the assembly line as a matched group. It is from this storage that parts are selected in groups, all panels for a range being selected with same color matching numbers and sent on to the main assembly line as a group, using the long bridge conveyor to carry them from the porcelain plant to the assembly line in the main plant.

Reconversion Tooling: J. W. Ingraham, superintendent, Tool Division, points out sequence of tooling up for production follows roughly the following pattern: Having determined output desired, manufacture is broken down into individual production operations, and length of time for each operation estimated. This permits setting up a layout for the production line, figuring out what machines and tools will be required, etc.

He reports punch presses tight, few having been required for war production so there is little excess equipment of this type available from war plants.

Mr. Ingraham also described the trend toward increased use of electric induction heating for brazing of small light sections in making many assemblies. Held in properly designed fixtures, it is possible to obtain exceptionally close tolerances on dimensions of assemblies made in this manner.

Operations at Mansfield have involved an enormous amount of resistance welding and this process will be utilized on a still greater scale.

Die steels are about the same as before the war, although they have been improved continuously in the ensuing years. Westinghouse employs some progressive dies.

Mr. Ingraham reports use of comparatively small amount of machining in this plant before the war. Now due to introduction of the Laundromat (automatic washing machine), much more machining work will be required, due to the need for machined parts in this unit. This item was not up to full scale production before the war and many parts formerly purchased will now be produced in the Mansfield plant, in turn adding to amount of machining involved.

The Tool Division has had excellent results with use of carbide tools and milling cutters. They are well liked and do excellent work. One thing Mr. Ingraham emphasizes is that it is essential to have all carbide tools ground by specialists in order to retain proper cutting angles. Machine operators are not allowed to sharpen carbide tools, which must be returned to tool crib when dull so grinding can be controlled properly.

He also reports a distinct trend toward the use of special purpose machines such as the 6-station Kingsbury which drills, reams, taps, bores, etc. at high speed . . . A typical special purpose machine is the 10-wheel polishing machine which automatically carries cast iron bases for electric irons under the 10 wheels, after they have first been milled. This machine employs a separate ammeter in the motor circuit of each of the 10 motors in order to be sure that the load is distributed uniformly between the 10 wheels. Otherwise it would be extremely difficult to prevent one wheel from taking less than its full cut, with the result that the next wheel would be overloaded.

Closer Tolerances: One important result from the plant's experience with war production is the familiarity with precision work obtained in the manufacture of aircraft parts where close tolerances are so essential for proper interchangeability and stress distribution.

This is expected to permit still higher quality of production, assure a better product and cut costs.

Carboloy Wire Drawing Dies Now Stock Items

Wire drawing dies of Carboloy, from R-1 through R-5, made by Carboloy Co., Inc. Detroit, now are packaged as stock items in quantities of 10 in strong cardboard cylinders having a waxed interlining which effectively protects dies from moisture. A sticker on lid of each carton carries such pertinent information as nib size, casting size, and hole size of dies. There are several sizes of specially designed cartons to accommodate various standard wire drawing dies.

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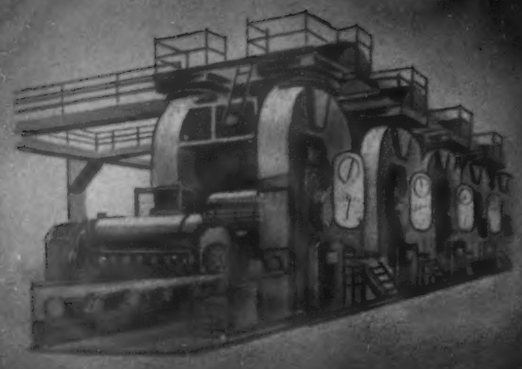

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..BY THE HYDRIDE PROCESS

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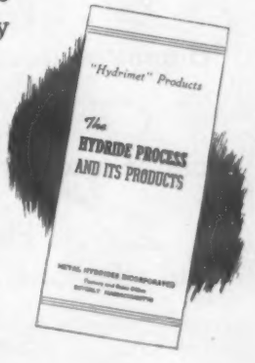
In addition to the binary forms listed above, Metal Hydrides can supply Master Alloy Powders in various ternary forms, produced by the same Hydride Process that guarantees each powder particle to be a true alloy of the desired composition. Also, all the alloy combinations listed above, as well as several Titanium-Copper and other alloys not listed, are available in ingot form as master alloy additions to molten metals.



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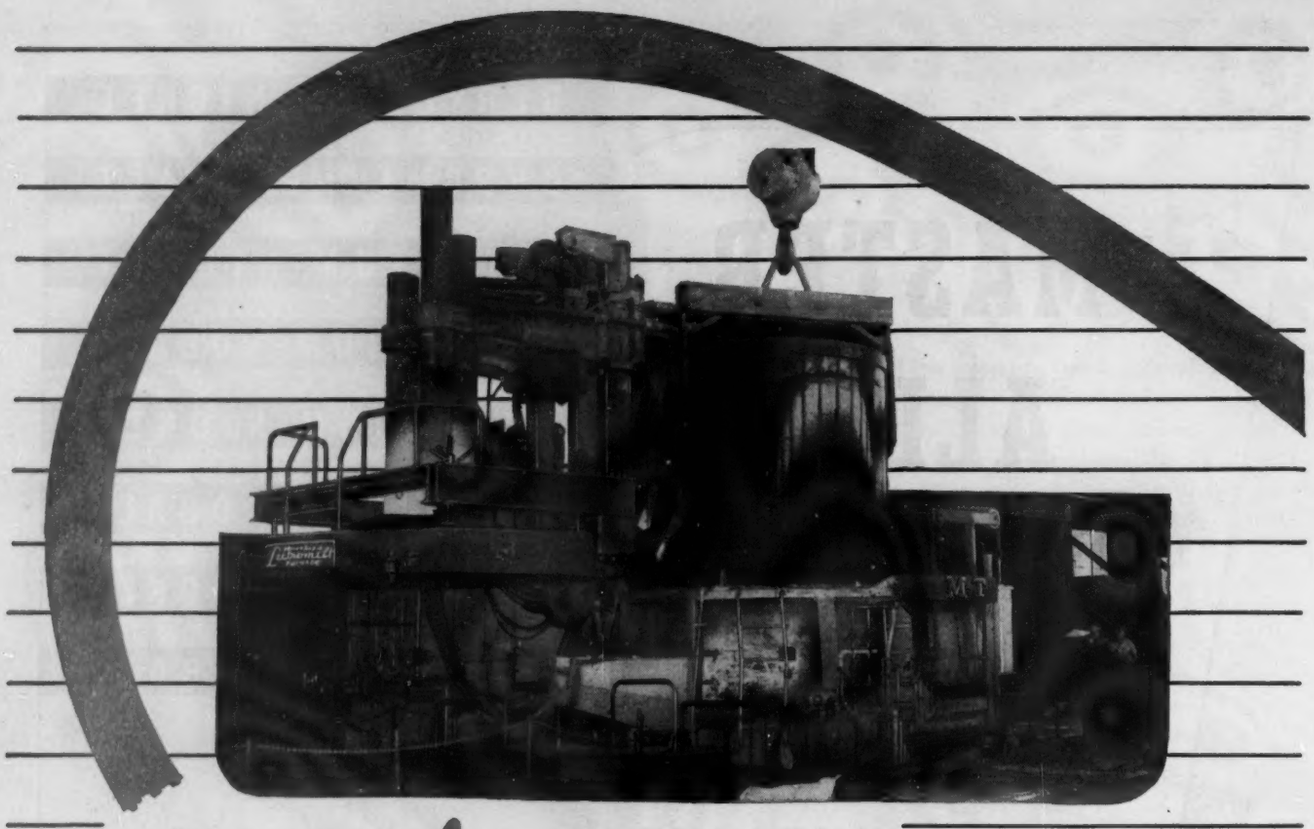

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Lectromelt Top-Charge capacities range from 100 tons down to 250 pounds. Illustrated is a size MT-25 ton Lectromelt being charged with a drop bottom charging bucket.

Literature on request.

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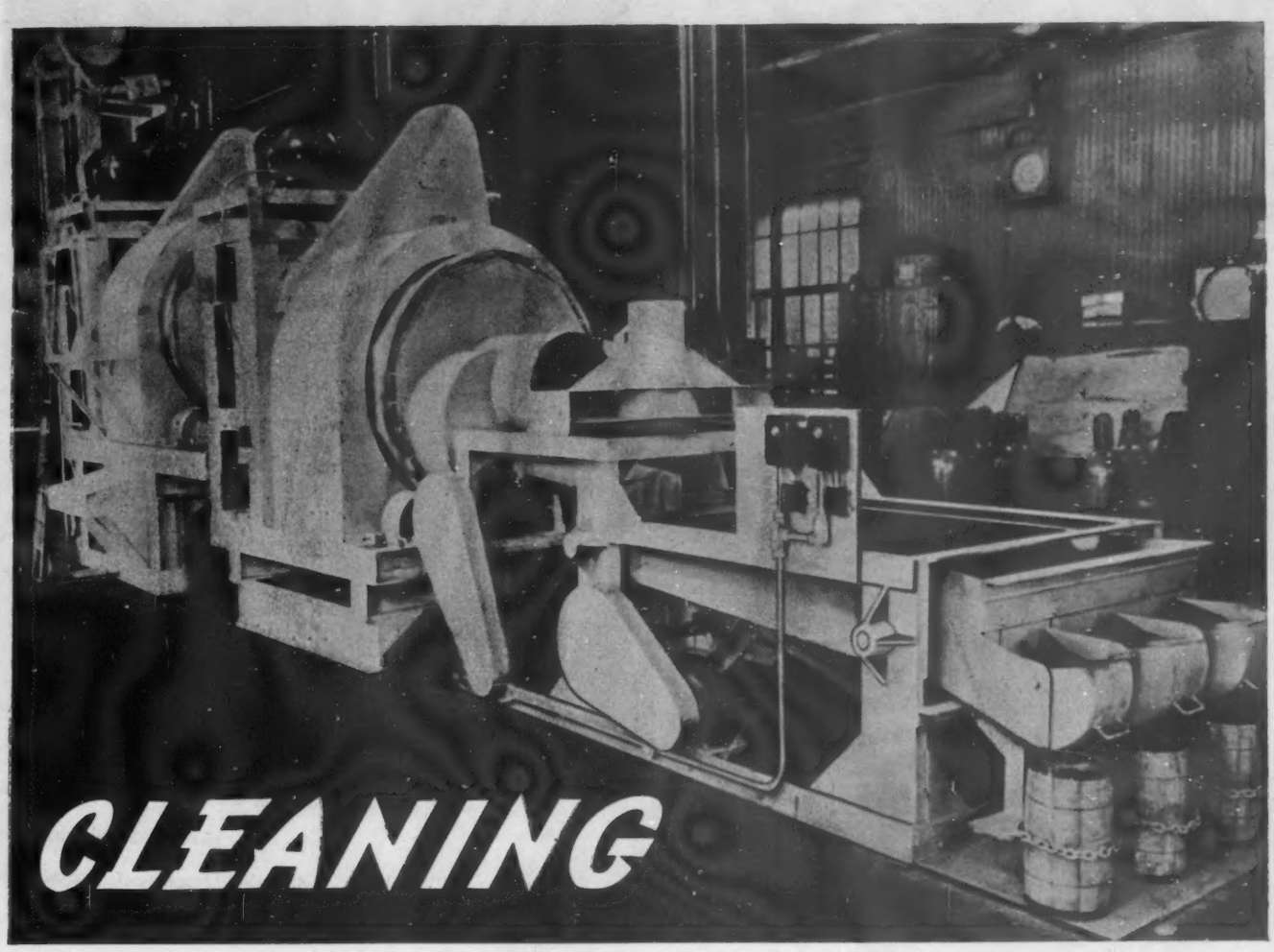


Fig. 1—Complete nail cleaning unit erected on shop floor

CLEANING AND DE-WHISKERING NAILS

New method entails tumbling the product in hot detergent solution and drying and burnishing in warm sawdust. Charging and discharging is accomplished automatically. Nails are coated by by-passing them to a drum containing lacquer and discharging into keg shakers

By A. J. LEHMAN
N. Ransohoff Inc.
Cincinnati

TWO problems are involved in cleaning nails. First, when the nails come from the dies, they are coated with a mixture of lime and with a soap used in drawing. This forms a hard, tightly adhering coating which must be removed from the nail. The second problem is that of removing the whiskers left by the cutting knives which point the nail. These cutting knives move on the same plane but do not touch each other because if they actually met they would quickly be dulled and worn out; therefore, a thin piece of metal or whisker usually remains on the point of the nail. In a few of the more modern plants whiskers are detached in the nail cleaning machine. However, the nails still have to be screened from the whiskers.

The cleaning and de-whiskering operation has traditionally been performed in side loading barrels. The nails are loaded into the tumbling barrels which are then charged with sawdust. As the barrel rotates, the whiskers are taken off the nails and at the same time the sawdust plus the tumbling action removes the soap-lime coating. The barrels are equipped with blind screens which permit the whiskers and sawdust to come out of the barrel but which will not pass the nails. In this way, the whiskers and sawdust are eventually removed from the barrel and only the nails remain. The nails are dumped onto a keg loading shaker which fits them into the kegs. The sawdust and whiskers must then be separated from one another

THE SATURDAY EVENING

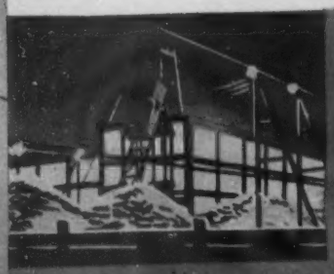
"It's the light one that's going with me!"

That's the way all America's going . . . toward *ultra-lightness with magnesium!* . . . ☆ You're very likely to find magnesium in a fine new portable typewriter . . . designed, styled, constructed in the best tradition of today. Take hold of the handle: Incredibly light! Lifts like a dream, to desk or shelf . . . swings lightly in your hand when you're off down the street. Strong and durable, too, this extraordinary metal—worth whatever slight price premium it may entail. ☆ Dow, of course, is not in the typewriter business. But the hundreds of diversified manufacturers with whom this foremost magnesium producer cooperates are planning now to bring you new and better lightweight products of many kinds.

Ready... to make products move!

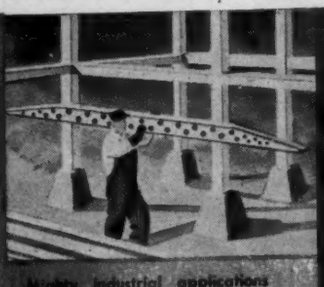
MAGNESIUM

LIGHTEST OF ALL STRUCTURAL METALS

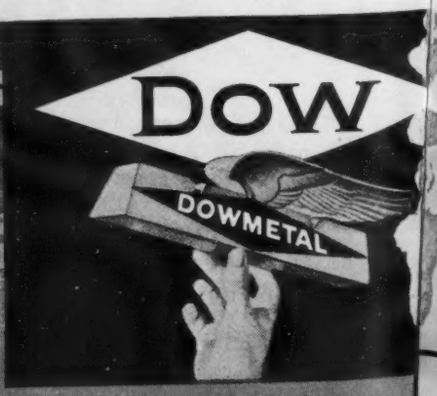


This metal from the sea, and from Michigan brine wells, too, is extracted in abundant quantities by Dow, the nation's foremost magnesium producer.

Best magnesium fabrication techniques are developed by Dow in cooperation with many skilled and experienced fabricators throughout the country.



Mighty industrial applications and fine consumer products are included in the growing list of magnesium items made through Dow cooperation.



MAGNESIUM DIVISION • THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago • St. Louis • Houston • San Francisco • Los Angeles • Seattle

Above is a reprint of a Dow advertisement appearing in full color in national magazines read by millions throughout America.

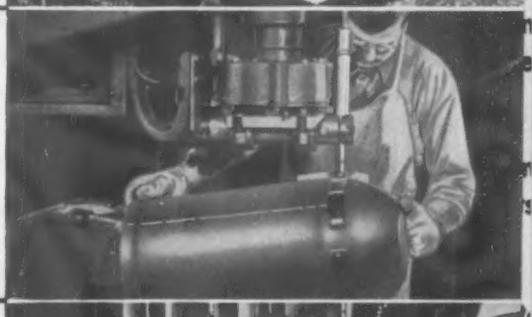
Magnesium makes products move

There's fresh new sales appeal for products of magnesium! They have just the kind of modern features everybody looks for nowadays. Magnesium gives them *lightness* unmatched by other common metals . . . a lift that makes them *move* in more ways than one! Yes, magnesium moves merchandise. And in the factory it speeds production, too. Foundrymen, die casters, mill operators, manufacturers—they know magnesium can save them time and labor and power. Easy to handle, easy to work, it's doing just that in many a modern plant. New applications that make the most of magnesium are hitting the market with the combined impact of these advantages . . . in sales . . . in production.

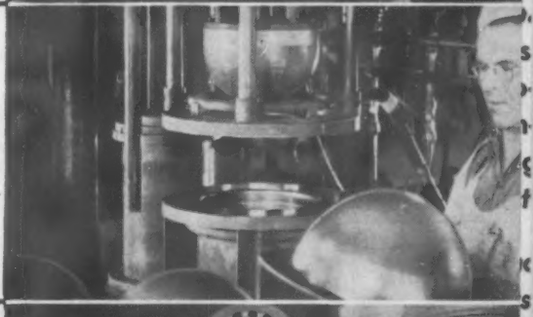
in the store . . . in the shop

MACHINING MAGNESIUM is commonly done at the maximum speeds of modern machine tools. Magnesium permits heavier depths of cut and higher rates of feed. Cutting tools stand up exceptionally well, too, and there's an additional saving in the power needed to remove a given quantity of magnesium by machining.

WELDING by all common methods is widely used in the manufacture of magnesium products of many types. Modern manufacturers are following well developed processes in joining magnesium by gas, arc, spot, and flash welding. The welding method employed on each specific product is governed by the type of joint and by service considerations.



FORMING operations with magnesium produce deep drawn parts of many kinds. Cylindrical cups, for example, are commonly drawn to a depth of 1½ times their diameter in a single draw by this hot forming method. This reduction in number of draws greatly decreases tool costs and manufacturing time.



HANDLING of parts and products is materially lightened wherever magnesium is used as a production metal. There's a notable lessening of fatigue and a corresponding economy in manpower in many a manufacturing operation with lightweight magnesium. These factors can add up to increased production volume and reduced costs.

MAGNESIUM DIVISION • THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

so that each can be disposed of to the best advantage.

When it is desired to cement-coat the nails, the traditional method is to pour the lacquer over the nails while they are still in the side loading barrel and tumble until dry.

This traditional method of cleaning and de-whiskering nails has a number of definite problems and one of the greatest of these concerns sawdust. Since the sawdust can be used only once, large quantities have to be bought and kept on hand. Sawdust is an expense and its storage and disposal in large quantities is both expensive and difficult.

Another costly item is the time required to clean the nails in sawdust. Here the entire operation is impractical because a dry barrel charged with sawdust is used to remove a hard coating which can easily be softened and removed by water. The fact that sawdust is continually being lost from the barrel thus reducing the amount of the cleaning medium and that the sawdust in the barrel quickly becomes dirty simply emphasizes the inefficiency of the operation.

Finally, the traditional method requires a great deal of labor. Nails have to be loaded into the barrel and at the end of the process, unloaded. Each step requires the removal and fastening of a heavy door. Sawdust must be collected and charged into the barrel and the used sawdust must be separated from the whiskers. If the nails are cement-coated there is an additional operation of putting the lacquer into the barrel, again involving the handling of a heavy door. Though some modern installations are equipped with automatic conveyors and feeding hoppers, the basic handling problems still remain.

A new and improved method of cleaning and de-whiskering nails which reduces the labor required, speeds up the operation and results in a uniform product, has been developed by N. Ransohoff Inc., Cincinnati. Nails are cleaned and de-whiskered by tumbling in a hot flowing basic solution thus increasing the speed of the operation. Sawdust is used only to dry and burnish the clean nails and therefore can be used over and over again. Patented automatic end-loading and end-unloading mills are used so that all charging and discharging operations are handled automatically save for the pushing of a button to start the whole operation and the kegging of the nails at the end.

When a batch of nails has been collected, it is charged into the first drum, either by a power loader or by a vibrating feeding hopper. The durm is equipped with a patented loading cone which prevents spillage. In this drum the nails are tumbled in a hot detergent solution which effectively removes the lime and drawing compound. The solution is recirculated from a heated tank beneath the drum by means of a vertical centrifugal pump without stuffing boxes or packing glands and with all bearings above the solution level.

During the cleaning cycle the whiskers are removed and screened out through blind screens. These screens are also used to drain the detergent solution back into the heated tank beneath the drum. The whiskers are caught in a chip basket or, if they are to be prepared for sale they may be continuously removed by a drag conveyor to a rotary dryer. The nails are not only cleaned in this first drum but are also partially burnished since the nails are permitted to rub on each other while being lubricated by the detergent solution. In this way, a bright nail is produced. Fast cleaning is also achieved since the detergent solution softens the dirt.

The drum is equipped with a patented discharge head, which permits automatic discharge of the nails by simply reversing the direction of rotation. When the nails are clean and de-whiskered, therefore, the direction of the drum's rotation is reversed and the nails automatically pass out of the drum and into the second drum where they are dried and polished by tumbling in sawdust. It should be noted that the nails are clean when they reach the sawdust; therefore, the sawdust remains clean and may be used again and again.

This second drum is equipped with a hood and plate gas burners impinging on the outside of the shell. This supplies sufficient heat to warm the sawdust and aids in drying the nails.

This second drum is equipped with a patented discharge head, similar to that in the first drum, and is emptied automatically simply by reversing the direction of rotation. When the nails are polished the drum is reversed and the nails and sawdust are emptied from the drum and onto a vibrating pan.

The sawdust and nails still mixed move down this pan and drop over an open step. As the nails and sawdust cross this step, the sawdust is sucked up into an exhauster and returned through a cyclone separator to the sawdust barrel. The nails continue onto the keg shaking pan, and are dropped into the kegs, ready for weighing and heading.

Nails that are to be cement coated are by-passed on a conveyor which carries them to the cement coating drum. This drum is the same general design as the other two drums and is discharged by reversing the direction of rotation. The cement is added to the batch through a slotted pipe extending the full length of the tumbling compartment and the batch tumbled until the lacquer is dry. The cement coating drum is located so that it discharges directly onto the keg shaking pan feeding the keg shakers.

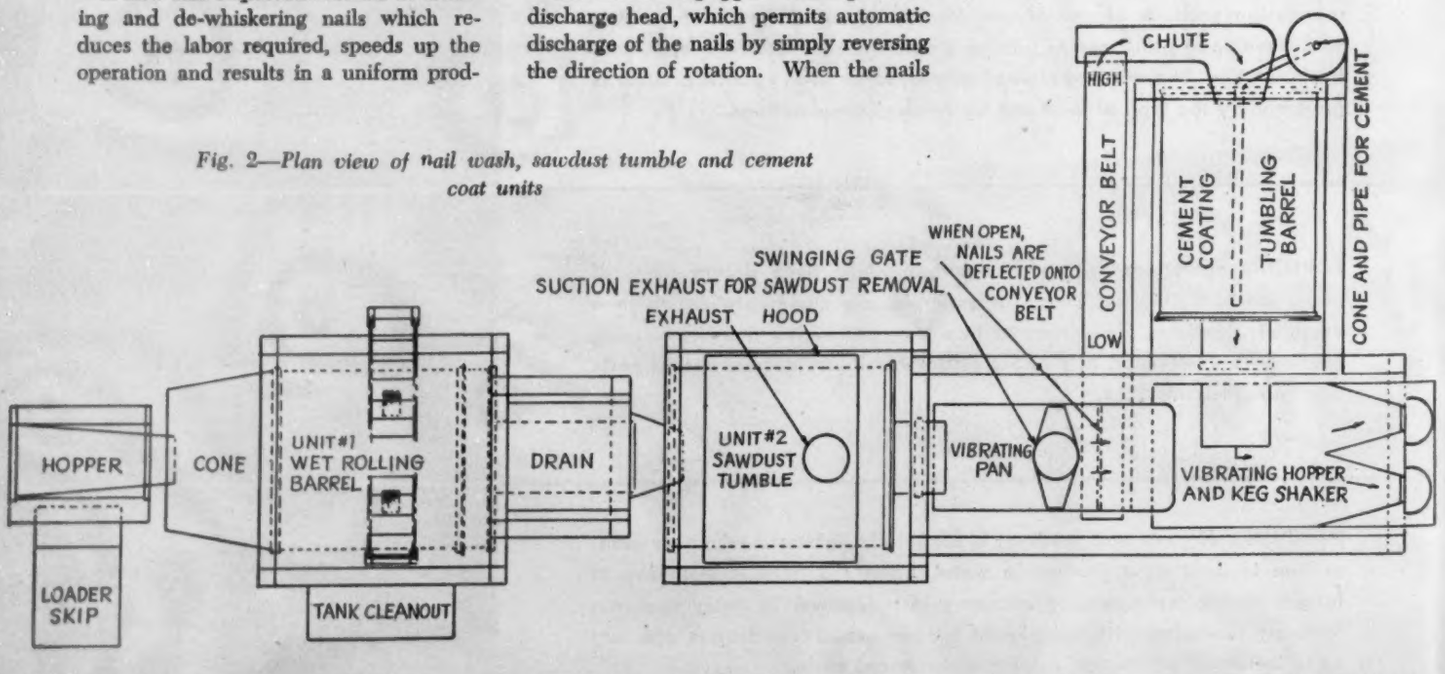


Fig. 2—Plan view of nail wash, sawdust tumble and cement coat units

Mass Production of Machined Weldments

at Lower Final Cost

Position welding sped the above base to the machining stage because position welding is down-hand welding—faster because push button control brings the weldment to any desired angle—lessens handling and propping.

Revolving horizontal and vertical tables—standard and right-angle heads on the horizontal boring mill above makes possible innumerable combinations of milling, facing, turning, and boring, and multi-surface machining without change of setup. These extensive facilities at the Danly plant plus the "know how" are speeding reconversion with mass production of large units.

Three factors vital in cutting costs of manufacture of large structures are grouped here:

1 ***Known quality of welding.*** Flaw-free welding to close tolerances makes for effective reductions in the cost of machining. Rough cuts are fewer or may be eliminated entirely.

2 ***The job should be of volume quantity.*** Repetition makes for greater efficiency, and tooling costs lower as they are spread over volume production.

3 ***Facilities must be adequate to handle the job.*** In Danly's modern plant are the welding facilities machine tools, normalizing furnaces, shot blast equipment, handling equipment, X-ray, Magnaflux, and complete inspection facilities for producing and delivering your job to any desired specifications at lower *final cost*

Avail yourself of Danly's efficient production program and fast delivery service. Call, write or send in your blueprints

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DANLYWELD

Radiographic Studies of Metals--Materials Subject of Meeting

Papers reveal steady progress toward attaining clarity of detail and image brightness by fluoroscopy and radiography

NINETEEN papers were presented at the three day program, Feb. 6-Feb. 8, sponsored by the American Industrial Radium and X-Ray Society, held in Cleveland in conjunction with the 27th National Metal Congress and Exposition. Dr. Dana W. Smith, Research Laboratory, Glenn L. Martin Co., Baltimore, opened the session and introduced Dr. H. H. Lester, physicist, Watertown Arsenal, who outlined the important role played by radiography in industry, and most recently, in its contribution to increased weld quality of war materials.

The Lester Lecture, "Advances in Steel Weldments in the Past Few Years" was given by the recipient of the second Lester Medal, Mr. O. R. Carpenter, Babcock & Wilcox Co. Awarded for outstanding contribution in industrial X-ray work, the first Dr. H. H. Lester Medal was presented in 1943 to Dr. George A. Russ, Claud S. Gordon Co.

Mr. Carpenter began his talk with a description of an early inspection method used to determine the soundness of welded joints. Quality of the weld was ascertained by listening with a stethoscope to the sound produced in the metal part by hammer taps; later, magnetic methods of inspection were also investigated. X-ray tube first used to gain better understanding of fusion welding was of the medical type as was the film, at that time the only kinds available. This installation was put into operation in 1929. By 1940 machines of a million volts were available. With the higher voltages a definite gain has been made in quality of definition.

Defects as revealed by radiographic examination were discussed from the standpoint of weld characteristics on killed, semi-killed, and rimmed steels. Causes for cracks in the welded structure, it was stated, are due to inclusions of sulphide in the steel which evolve gases during welding, and to segregation along edges of plate.

Other topics discussed by Mr. Carpenter were wave absorption diagrams and the Sperry Supersonic Reflectoscope. A comparison was made of weld defects as shown by radiographs and wave diagrams.

Dr. Leslie W. Ball, Triplett & Barton, Inc., discussed design considerations of a 30-250 KV unit in his paper, "X-Ray Quality, its Measurement and Significance in Industrial Radiography". Measurement of x-ray quality is expressed as (1) penetration, and (2) sensitivity—or the ability to record on film—and these, said Dr. Ball, are the two primary interests of radiographers. Therefore, in developing a machine which would improve the quality of x-rays, calibration and analysis of emissions were some of the factors that had to be covered. Advantages of the x-ray tube grid were discussed: Harder rays are produced with a space charge device which consists of a filament imbedded in a sheath. Also, constant potential equipment eliminates factors or variables of transformers, tubes, etc.

"The Influence of Inherent Filtration of the X-Ray Tube" by Mr. E. Dale Trout, General Electric X-Ray Corp., was a discussion which considered the inherent filtration of the x-ray tube or x-ray unit rather than the so-called added filter. "With exception of some experimental systems," said Mr. Trout, "there is no such thing as an unfiltered x-ray beam." The effect of the tubes on radiation varies with the type used, consequently the need for a method to evaluate the filtration system.

Method of Plotting Data

Unlike the physicist, the radiographer plots his data in the form of a transmission curve rather than an absorption curve since the curve indicates the fraction of the unfiltered beam that emerges through an absorber of known thickness. Since the voltage is known, the unknown in the system is the inherent filtration. There is a need, Mr. Trout stated, for some method permitting comparison of the character of the radiation that emerges from the x-ray source after passing through the inherent filtration. Generally accepted way, said he, is to state the voltage and the thickness of the filter necessary to reduce the intensity of the x-ray beam by one-half. This thickness of filter, in mm, is called the half-value layer. The half-value layer is easily read from the transmission curves since it is the filter thickness that corresponds to a transmission of 50 per cent.

The inherent filter to a large degree determines the minimum voltage at which satisfactory radiographic or fluorscopic results may be obtained with a given equipment. "--- it can be said that the inherent filtration of the x-ray source has a definite bearing on the radiographic and fluoroscopic result. A reduced inherent filtration is in general desirable. A study of the inherent filtration as reflected in a transmission curve may do much to explain an unsatisfactory result or an uneconomical operation."

"Fluoroscopic Examination of Metallic Objects" prepared by Dr. Donald S. Clark and Dr. Benedict Cassen, California Institute of Technology, was read by Dr. R. C. MacMaster, Battelle Memorial Institute. Description was given of apparatus designed and used for the inspection of sand and permanent castings of aluminum and magnesium alloys. Method of control of variables was obtained by making standard blocks with artificial flaws. A new type of window was developed which utilized a large Lucite box filled with a saturated lead perchlorate solution. These were an improvement over the lead screen windows because the latter became unusable for making radiographs inasmuch as they absorbed so much radiation.

Movable Tube Employed

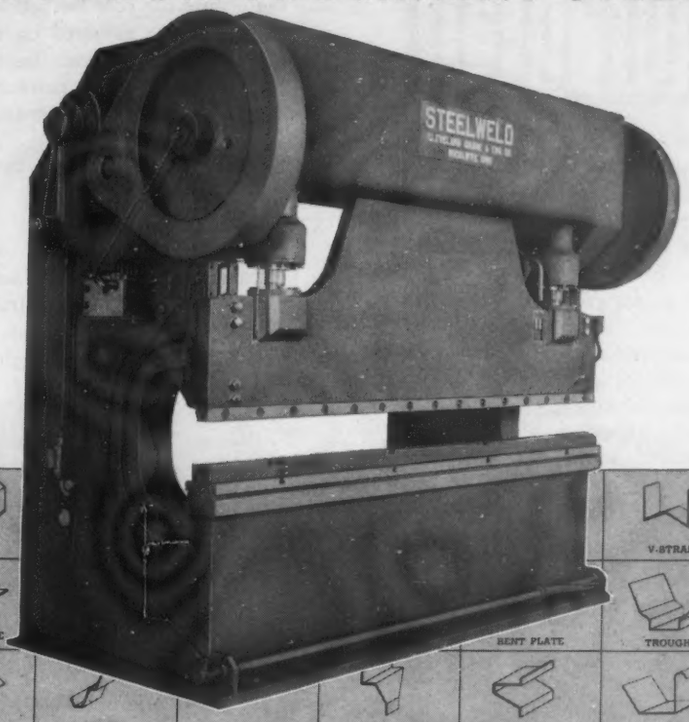
Tube was made movable for the inspection of castings to overcome difficulty encountered with moving the castings of various sizes and shapes with jigs and fixtures. It was learned that defects which could not be detected fluoroscopically had no effect on the failure of material (determined by loading in a Universal Loading Machine). For steel thicknesses of ¼-in., results obtained with voltages of 140 KV were better than those procured with 200 KV.

In the question period that followed the reading of the report, it was disclosed that the moving tray technique was adaptable to straight line inspection methods. In the California Institute of Technology laboratory, 500 to 1000 castings were inspected in 1-1½ hr periods. Operator fatigue was kept to a minimum by providing proper lighting, i.e., room illumination and screen brightness were of comparable intensity, at the same time the former provided normal requirements for writing. Increased brightness of the screen was achieved by bringing the tube as close as possible to the object, no loss of detail was noted by doing this.

Lt. Donald T. O'Connor, U.S.N.R., Ordnance Investigation Laboratory, discussed the methods developed to obtain adequate pictorial representation of interior structure of mechanical, optical,

(*Please turn to Page* 148)

WORDS FROM PROMINENT STEELWELD PRESS USERS



SAVED US CONSIDERABLE MONEY

"We installed this press brake approximately a year-and-a-half ago, and the performance of it has exceeded our expectations. This press brake is constantly in use and has saved us considerable money in the fabricating of items used in the products we manufacture. Our only regret is that we did not purchase this machine several years ago. We will be very glad to recommend this brake to anyone requiring a machine of this type."

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CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

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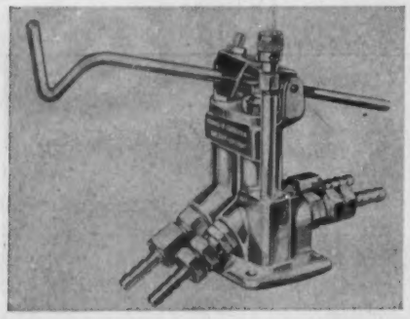
INDUSTRIAL EQUIPMENT

Gas Saving Device

A new and improved Gasaver, which is said to cut oxygen and acetylene consumption as much as 50 per cent, is announced by Weldit Inc., 648 Bagley avenue, Detroit 26.

The device has two important features not found in earlier models: First, it has



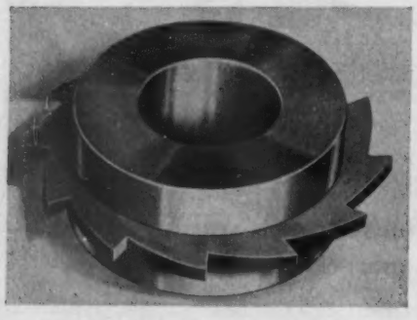
a new nonsmoking pilot light; second, the lever rod, on which torch is hung between welds to shut off both gas and oxygen intake lines, is quickly adjustable as to length, so that any size or weight of torch will automatically operate the closing valves.

The Gasaver, regardless of the weight of torch used, eliminates the danger of open flame.

Steel 2/18/46; *Item No.* 9001

Slitting Saw

Designed to reduce tool breakage, a new commutator slitting saw is announced by Gay-Lee Co., 117 East Hazelhurst, Ferndale 20, Mich. Made with a steel hub permanently bonded to a Car-



boloy cemented carbide blade, it is intended to eliminate fracturing due to the strain imposed by mounting screws or nuts.

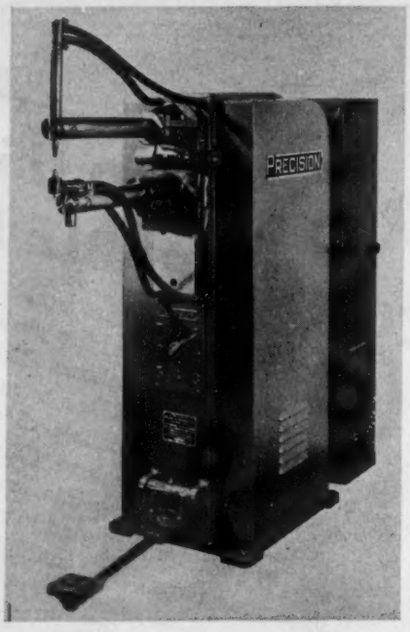
In addition to the longer life made possible by this innovation, teeth are generated to provide maximum strength and long life. Cutters are slightly concave to insure proper clearance. The blades perform undercutting and U-slotting operations to exceptionally close tolerances. Hub is designed to support the cutting edge.

The device is made in a wide variety of standard sizes, and in special sizes to customers' specifications.

Steel 2/18/46; *Item No.* 9009

Spot Welder

In keeping with the recently announced rocker arm air operated spot welder, Precision Welder & Machine Co., Cincinnati, announces a new rocker arm foot operated spot welder. This ma-



chine overcomes the major objection to foot operation, lack of pressure by a unique mechanism combining high pressures with minimum operator fatigue.

Among its features are: High welding pressures up to 400 lb on the electrodes with 50 lb exerted by the operator; minimum foot treadle movement of 2½ in. giving 1¼ in. electrode movement, also adjustable for best operating conditions; unit construction with removable side covers keeps maintenance to a minimum; machine styled to combine maximum rigidity with pleasing appearance; sides of machine are kept clear for material handling and storage in keeping with motion-time production methods; completely new design of transformer mounting clamps the core the full length; timer and contactor mounted on rear; microswitch firing of timer insures pressure before flow of weld current; fabricated frame of channel construction insures rigidity.

Steel 2/18/46; *Item No.* 9000

Foot Switch

Model MK is a new, foot switch developed by General Control Co., 1200 Soldiers Field road, Boston 34, specially adapted for home use, light machining

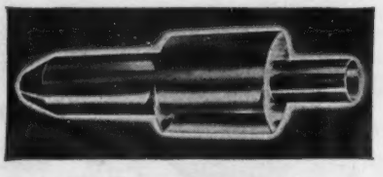
operations, photo printing, communications equipment, etc. Treadle is ⅛-in. from the floor and requires ⅛-in. throw to trip the switch, so that operator fatigue is reduced to a minimum. Entire toe treadle is covered by a welded steel housing, thus making it completely safe from accidental actuation. This model is made in one type with a single pole, normally open, Acro switch element.

This foot switch is a quality product, made of welded steel throughout, and is finished in baked enamel. Four holes are provided in the flanged base for mounting to the floor.

Steel 2/18/46; *Item No.* 9005

Gas Cleaner

The air cleaning tube made by Aerotec Co., 61 West Chester avenue, White Plains, N. Y., can be used in multiples up to any desired capacity, and is



claimed to have exceptionally high precipitating efficiency and to develop no pressure build-up. Clean air is exhausted from central tube while the dust is precipitated from the bottom. A single tube has a capacity of 30 cfm at 4 in. w. g. resistance.

It is being used for reclaiming valuable

(All claims are those of respective manufacturers; for additional information fill in and return the coupon on page 132)

Hot and Heavy But Running Cool

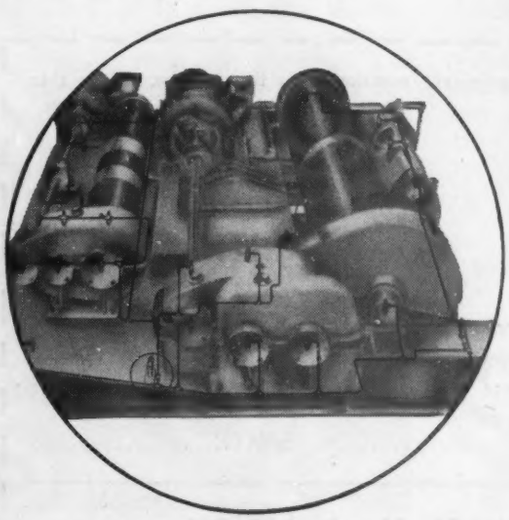
No wonder steel plants are turning to Alemite Centralized Lubrication Systems

In the world's largest steel plate mill, 40 huge overhead traveling cranes are equipped with Alemite Centralized Lubrication Systems. Each crane is safely, positively lubricated from a few central points in only 10 minutes! Previous time—1½ hours per crane—and bearing failures were too frequent. But now, every lubrication point gets its proper lubricant at the proper time, in the correct amount. Human error is eliminated. "Downtime" of each crane is cut to a minimum.

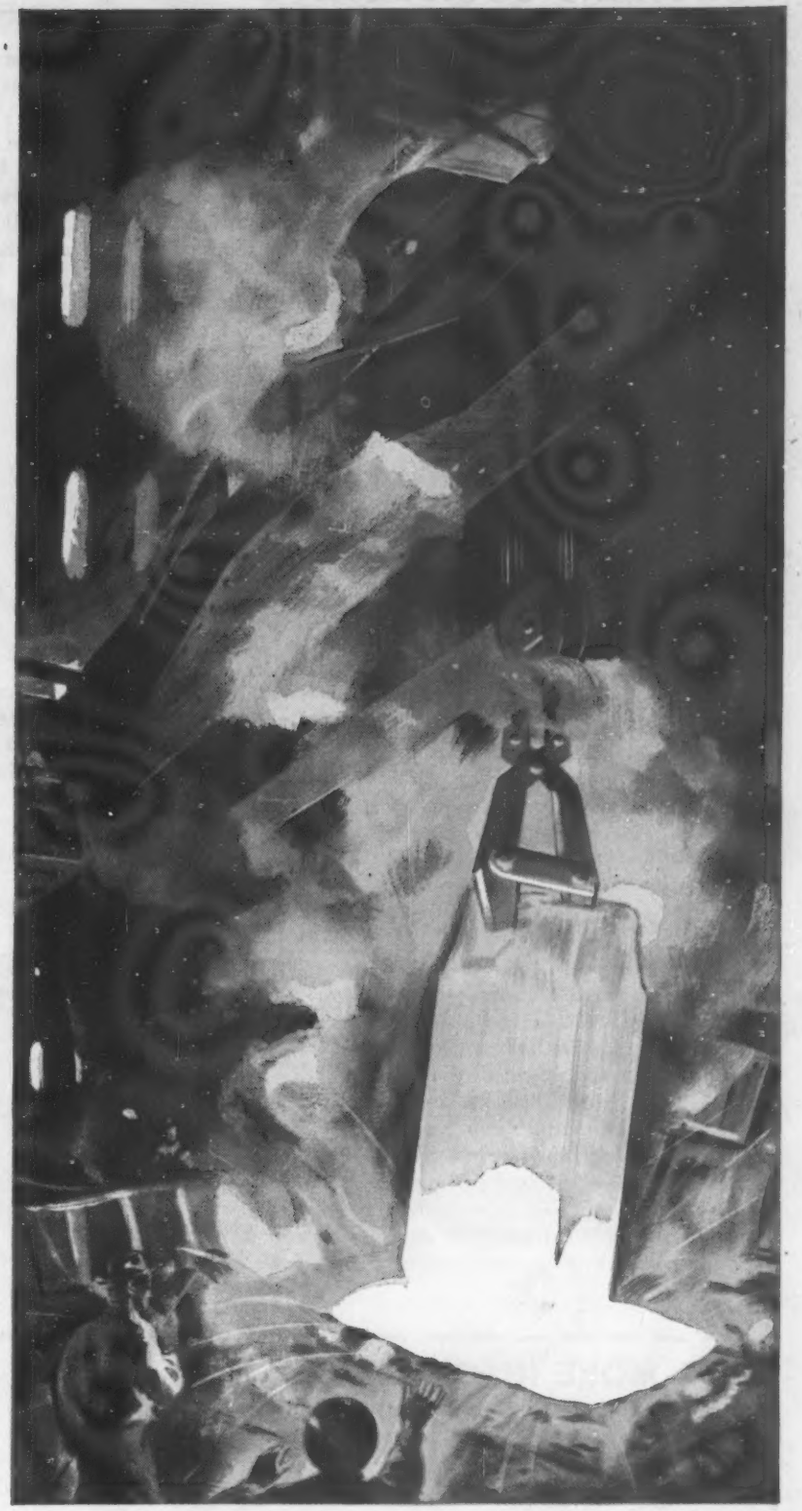
* * *

Other Examples: In a well-known locomotive plant, mammoth overhead traveling cranes are lubricated positively from a few central points in only 15 minutes per crane. The cranes operate smoothly and efficiently at all times. Oilers work in safety. Human error is eliminated. "Downtime" due to failure of lubricated parts is abolished.

In a famous plant, a battery of 7 automatic punch presses with a total of 86 bearings are equipped with an Alemite System. All bearings are lubricated from 1 central point in 3 minutes' time a week. *And the presses don't stop for lubrication.*



Typical installation of Alemite LubroMeter Centralized Lubrication System on heavy machinery ... a trolley on an overhead traveling crane.



To Executives: See One or All 4 New Alemite Systems Demonstrated ... Right at Your Desk.

• Without obligation, have an Alemite Lubrication Specialist demonstrate Alemite systems right in your office with transparent working models. Examine them minutely. Work them yourself. They're designed for automatic or manual operation and handle oil or grease. You'll see how they can be adapted to almost every machine—and how they give any plant "M.P.T."* Drop us a line—Alemite, 1879 Diversey Parkway, Chicago 14, Illinois.

**More Productive Time*

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ALEMITE

Alemite **ALONE** *Combines all 3 in Lubrication*

1. EQUIPMENT 2. PROCEDURES 3. LUBRICANTS

powders; intakes on diesel and gas engines; cleaning dangerous dust laden air in industrial and chemical plants; and in other applications requiring high collection efficiency.

Steel 2/18/46; *Item No.* 9986

Air Foot Control and Valve

Foot pedal designed by Redmer Air Devices Corp., 601 West Washington boulevard, Chicago, makes valve operation as tireless as possible. Opening and closing of the plunger of the valve on

the foot pedal is operated by a roller on pedal casting which relieves wear on plunger and facilitates its operation. Valve can be removed from the foot control and used as a separate unit in conjunction with cam operations.

Steel 2/18/46; *Item No.* 9017

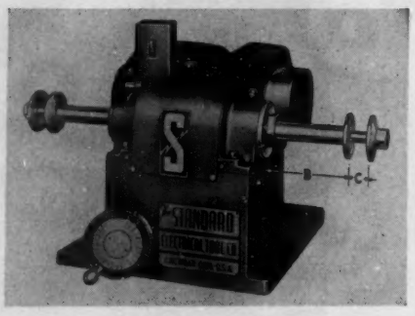
Buffing, Polishing Unit

Standard Electrical Tool Co., 2504 River road, Cincinnati 4, announces Type 1BVB infinitely variable speed buffing and polishing machine. It is powered by a 1 hp motor and operated by toggle switch. Through the Speedial control located at front of machine it is possible to instantly obtain any spindle speed variation between 1500 and 3000 rpm.

This unit will serve advantageously in the production of small parts for either buffing or polishing at the correct spindle speed, and as wheels wear, spindle speed may be increased for maintaining the correct peripheral speed.

Unit is illustrated on bench base and is equipped with flanged spindles, but an order can be furnished with taper spindles such as used in some production and jobbing shops. Also available in pedestal model.

The B dimension in the illustration is 6¼ in. C 1¼ in. and diameter of spindle

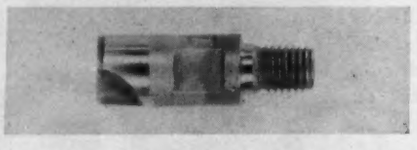


between flanges ¾ in. Height from bottom of base to center of spindle is 10 in. on the bench model and 39 in. on the pedestal model. Distance between wheels 23½ in.

Steel 2/18/46; *Item No.* 9011

Rivet Shaving Cutter

A new rivet shaving cutter is announced by Zephyr Mfg. Co., Inglewood, Calif. The cutter will fit the company's



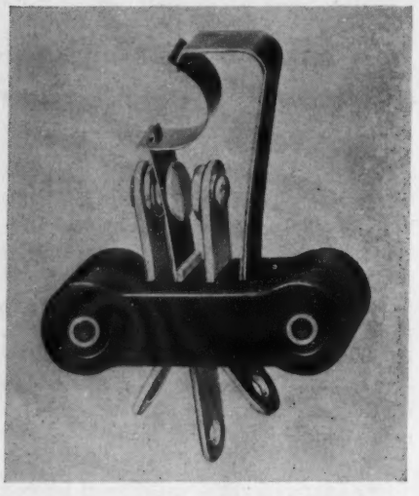
standard micrometer stop countersink drive as well as standard rivet shaving machines.

Tests on this cutter show that the average use is from 18-20 hr. It is made of 18-4-1 steel and is electrolized which provides a surface hardness of approximately C-82. The device is available with tungsten carbide tips on which the average use is from 36 to 40 hr.

Steel 2/18/46; *Item No.* 9010

Open Blade Snap-Switch

A new type smaller size open blade snap switch is announced by Acro Electric Co., 1323 Superior avenue, Cleveland 14. Identified as Model M, it was developed to fill the need for a more compact, sturdy switch for vertical



mounting. Engineered for unusual compactness for mounting in multiples as well as singly. Operating blade, center blade and patented rolling spring are made of a heat-treated beryllium copper to withstand high capacity and long life. Overall dimensions are approximately 1 13/32 x 1 1/64 x 5/16 in. Standard operating pressure is 6 to 10 oz.

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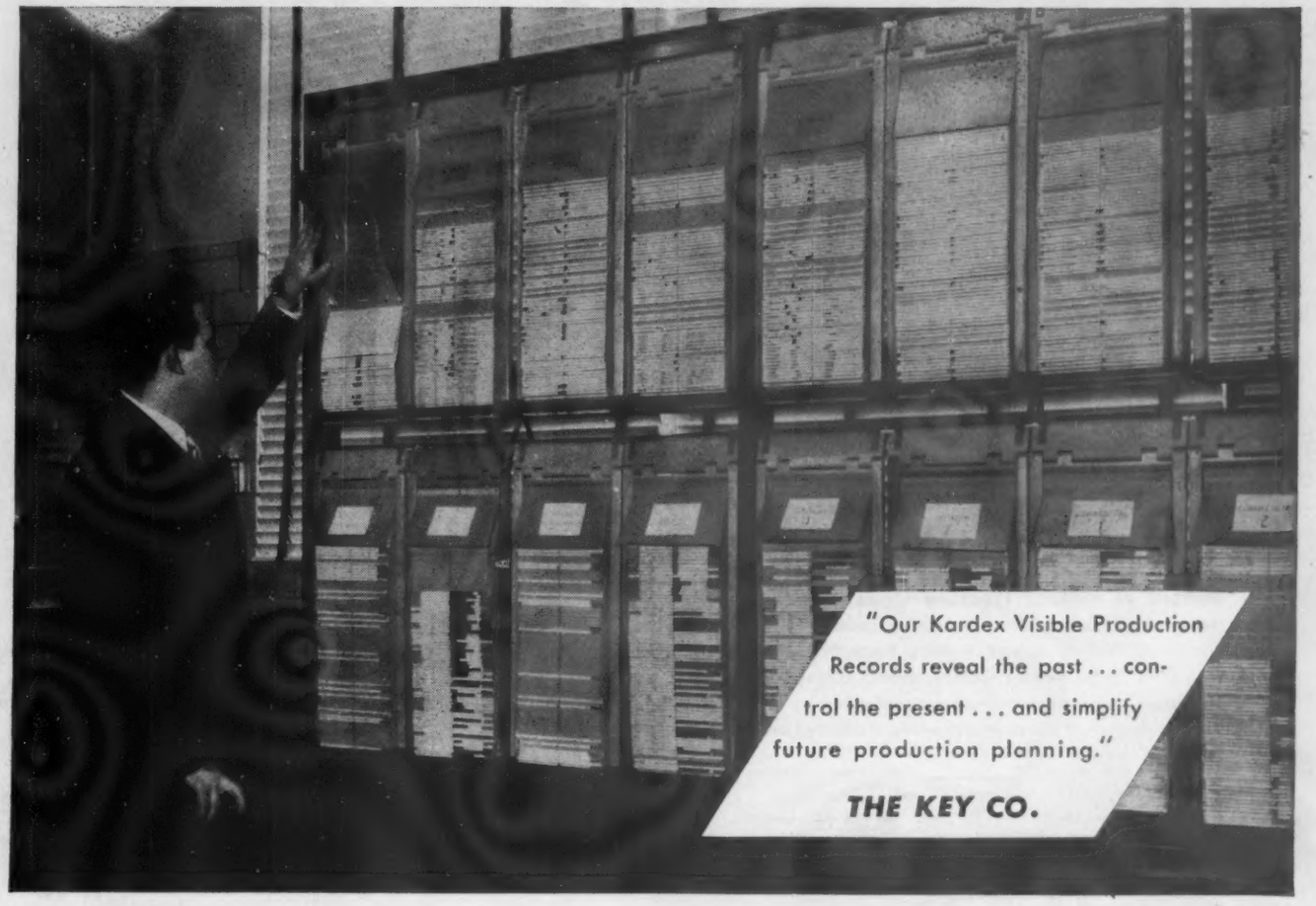
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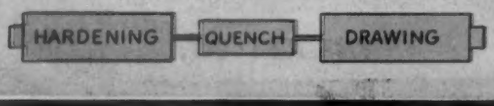

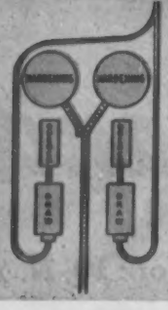

Two 8-inch Shell Heat Treating Units, each line consisting of a Rotary Hearth Hardening Furnace, Quench Tank, and Chain Type Recirculating Air Draw Furnace.

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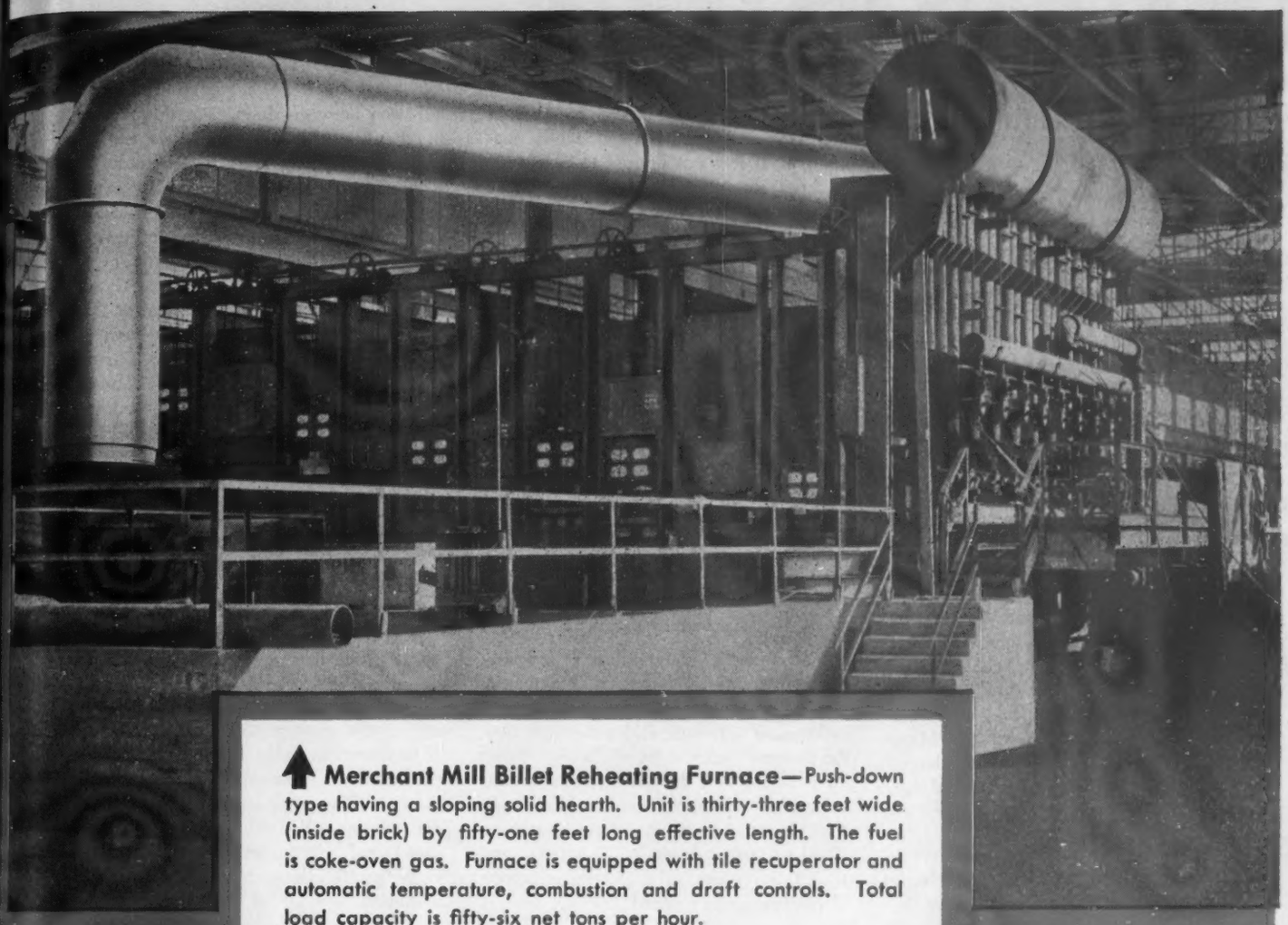
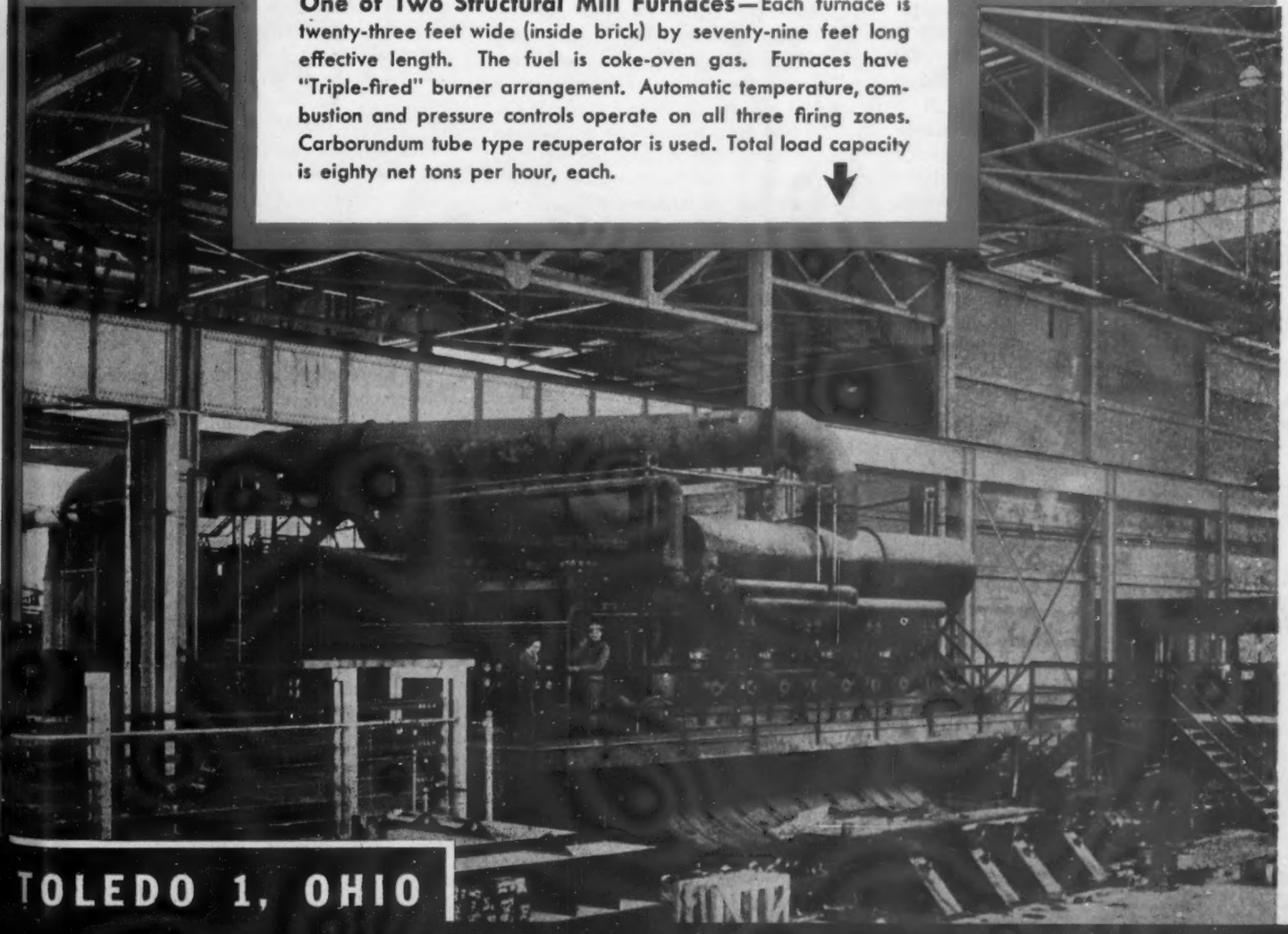


Merchant Mill Billet Reheating Furnace—Push-down type having a sloping solid hearth. Unit is thirty-three feet wide (inside brick) by fifty-one feet long effective length. The fuel is coke-oven gas. Furnace is equipped with tile recuperator and automatic temperature, combustion and draft controls. Total load capacity is fifty-six net tons per hour.

One of Two Structural Mill Furnaces—Each furnace is twenty-three feet wide (inside brick) by seventy-nine feet long effective length. The fuel is coke-oven gas. Furnaces have "Triple-fired" burner arrangement. Automatic temperature, combustion and pressure controls operate on all three firing zones. Carborundum tube type recuperator is used. Total load capacity is eighty net tons per hour, each.



• TOLEDO 1, OHIO

Metal Coated Plastics

(*Continued from Page 95*)

warm nickel carbonyl. This method is not used because of the expense and the highly poisonous nature of the metal carbonyls. Illustrations of the reduction of metallic compounds in solutions are the reduction of gold, silver, copper, or lead compounds with appropriate reducing materials such as formaldehyde.

A large number of formulas for such reduction have been patented or otherwise published. The production of silver films by chemical reduction is the method most widely used today for coating plastics with metals. There is an application for the reduced silver film itself for mirrors, but the major application for this film is as a conductive coat for electroplating. In this process, the plastic is sensitized with a solution whose main ingredient is stannous chloride and then silvered with a mixture composed of freshly mixed ammoniacal silver nitrate and a reducing solution. Many special variations for particular plastics and specific uses have been worked out.

Electroplating Plastics

The last method, metallizing by chemical reduction, is by far the most widely used present-day method for coating plastics with metals. The major application of this initial, chemically precipitated film is as a conductive coat for subsequent electroplating. The advantages of this process are that it is well suited to rapid production scale work, it is generally considered the most economical of the processes, the results obtained are fairly uniform, and in general the manipulations involved are more simple. There are a number of methods described in the literature and patents on this type of electrodeposition, but in general the same basic results are accomplished—namely, the application to the plastic surface, after proper preliminary treatment, of a highly conductive and strongly adhering bond coat which can subsequently be electroplated.

A patented process involving the production of silver film by chemical reduction, known as the Metaplast process[3], is the most widely used commercial method for coating plastics with metals. The Metaplast patented process is based on silvering by reduction in the presence of a solution consisting of tin and hydrochloric acid. This furnishes a tight bond to the plastic on which electroplating in the conventional manner can then proceed.

The suitability of a conductive coat for electroplating may be tested with an ohmmeter. Some of the above processes can be used several times to give second or third coats of conductive material, if a specimen is found not sufficiently conductive. If it is not desired to coat some surfaces, stop-off methods using masking tape or a stencil with stripping lacquers may be employed.

The electroplating process itself follows standard practice with minor variations. Thus, since the conductive coat is very thin, a very high current density cannot be used initially on a large piece unless a number of contacts are made for distribution of the current. Hot baths should be avoided because they soften some plastics and distort others. Furthermore, since the conductive coat is usually porous, highly acid or alkaline plating baths cannot be used on all plastics.

Preparation of the Plastic for Metal Coating

Many plastic manufacturers and finishers in trying to put metal coatings on plastics have obtained poor results, especially poor adhesion, and concluded that the process tried was unsatisfactory. They have overlooked the vital effects of the nature of the plastic surface itself. If the plastic surface is porous, such as wood or porous ceramics, it is necessary to fill the pores in the surface before electroplating is successful. Such sealing may be accomplished by the application of shellac or varnish.

Non-porous plastics also usually require special preparation depending upon the thickness of metal coating to be applied and the conditions to which the finished object will be subjected. If the metal coating is thin, it can be made to adhere very well if properly applied, even though the surface is smooth. Therefore, for the production of mirrors or decorative reflective coats where the surface will not be rubbed or where lacquering or other protection can be applied, a mirror-smooth plastic surface is entirely satisfactory. It must be borne in mind that very thin metal films even though mirror-like and highly adherent are nevertheless porous.

The most common method of improving adhesion is to roughen (depolish) or swell the surface. The most commonly used methods are dry blasting and wet-tumbling, adjusting the type and size of grit to the particular plastic, and the type and thickness of metal. Chemical roughening methods include etching of ester type plastics with caustic solutions, treating of casein plastics with hydroquinone solutions, and swelling the phenol condensation products with acetone.

Design of Plastics for Plating

Metals and plastics have greatly different chemical natures with reference to valence forces, and there is no "natural" adhesion between them. For this reason in the application of metal layers to plastics, special methods must be used to secure satisfactory adhesion. However, even the best of these methods has not achieved maximum possible adhesion because on attempting to separate the metal from the plastic, the failure is at the joint and not within the metal or the plastic; that is, the metal-plastic bond is still the weakest link in the chain. Therefore, when designing a plastic object which is to be metal plated it is necessary to bear in mind the conditions which may cause failure of the bond and, wherever possible, select features of the design which will produce improved adhesion. Obviously indentations, grooves, reentrant curves will improve adhesion by providing mechanical interlocks. Frequently, such features may be made part of the design for ornamental reasons so that the appearance may be enhanced at the same time the adhesion is improved.

The most important factor causing failure of the metalplastic bond is change of temperature owing to the different coefficients of expansion of metals and plastics. The magnitude of this factor depends upon the area of contact of the metal and plastic, especially flat area. Consequently, the plastic should have the minimum amount of flat area possible consistent with the use of the article. As a result of change of temperature, the metal-plastic bond is weakened. Sometimes, the bond fails and a blister forms. The tendency to form such blisters is lessened if the object contains rounded projections. Frequently, such mounds may be made part of the design for ornamental reasons. In general it may be said that for maximum adhesion of a metal coating on a plastic, the design should provide grooves, reentrant curves, rounded projections, and minimum possible areas of flat smooth surfaces.

Adhesion of Metal Layers on Plastics

For some applications of metal plated non-conductors, the metal layer is stripped, as in electroforming and electrotyping. Indeed, the electrotyping industry in which copper is plated on wax and other non-conductors is the largest application of the deposition of metals on non-conductors. It is some 100 years old. However, for most applications of metal plated plastics, the metal layer remains on the plastic, so that good adhesion is desirable. For some of the recently developed industrial uses, excellent adhesion under extreme temperature and humidity variation is essential.

Owing to the greatly different chemical natures of metals and plastics, there is no "natural" adhesion between the two. For this reason, mechanical inter-

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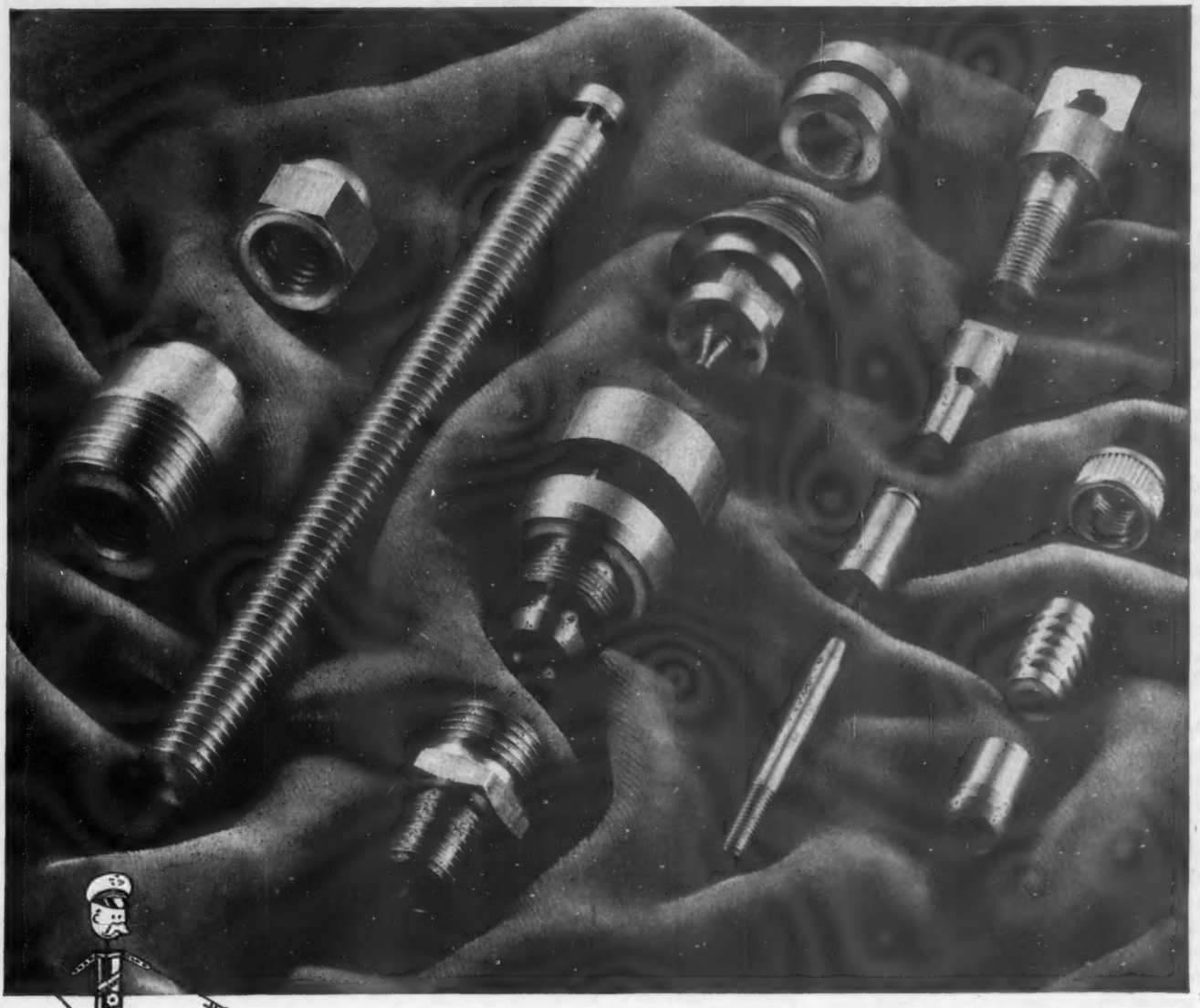

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locking methods such as roughening of the plastic must be used. But even in such case, it is difficult to obtain good adhesion if the metal is to have appreciable thickness (0.001 in. or more) because of the different coefficients of expansion of metals and plastics. The coefficients of expansion of metals vary from 0.5 to 3 x 10^{-4} per degree C, highest values being those of cadmium, lead, and zinc. The very useful metals—copper, nickel, and silver, have values about 1.5 x 10^{-5}, and chromium has the value of 0.8 x 10^{-4}. The coefficients of expansion of the plastic vary from 2 to 20 x 10^{-5} per degree C, lowest values being attained by only a few of the phenol-formaldehyde types. Polystyrene, one of the most useful of the plastics for electrical purposes, has a coefficient of expansion about 7 x 10^{-5}. It is therefore evident, as has already been pointed out, that for good adhesion of metal films of appreciable thickness special precautions must be taken, such as design of the plastic to provide grooves, reentrant curves, rounded projections and a minimum area of flat smoth surface.

Intermediate Layers Add Complications

In most metal-plastic combinations, there are one or more intermediate layers between the metal and the plastic. The most common intermediate layer is a conductive coat such as graphite, bronze powder, or chemically reduced silver, which must be applied before electroplating. Other intermediate layers sometimes used are wax and varnish. These intermediate layers complicate the situation considerably. Naturally, unless they adhere both to the metal and the plastic, the strength of the bond will be low. Maximum adhesion between two surfaces such as metal and plastic is dependent on the formation of an interlayer which is stronger than at least one of the materials joined, so that, on attempting to separate the object as in tension or shear, the failure will be within one of the materials and not at the interlayer. These conditions must be met:

(1) There must be no weak interlayers such as grease and dirt, owing to improper cleaning or preparation.

(2) There must be no weak interlayers such as non-adhering powder owing to improper application of conductive layer or improper plating.

(3) All intermediate layers must be joined to neighboring layers by bonds stronger than the cohesive strength of the weaker material of the two to be joined. These bonds at the interlayer may be mechanical, owing to the interlocking of rough surfaces, or may be valence forces, owing to specific attraction between the two materials.

One of the upsets often encountered by plastics seeking to replace metals in ordinary applications is cost. The plastic base of any plated product is generally considered more expensive than a base of iron, steel, or aluminum. Owing to the necessity of making the surface conductive, the cost of metal plating on plastics is naturally greater than electroplating on metal surfaces. In addition to the cost of the bond coat, there are other factors which increase the expense. For example, metal plates on plastic are usually thicker than plates on metals with attendant increased cost of metal, electricity and labor. The length of electroplating time and the needed thickness depend upon the desired use and properties of the finished assembly.

Some Results Overbalance

In highly competitive assembly line operations, such as the automotive industry where costs are closely figured this may prove fatal. In decorative and luxury applications weight savings and increase in "eye appeal" may far overbalance the increased costs. The engineering applications particularly in electricity, electronics, and aircraft fields have little concern with minor cost differences. The metal plating of plastics has opened up vast new fields in electricity and electronics. Synthetics, particularly the styrenes and phenols possess excellent electrical insulating qualities, so the plating of these materials makes available to the electrical and electronics industry a unique product—a combination having the inherent advantages of the plastics plus the required properties of electroplated metals.

Aluminum and magnesium are being replaced by plated plastics in aircraft for electrical and radio shielding devices, thereby eliminating costly insets and assembly operations, giving a product which is lighter, more quickly fabricated, and much more resistant to vibration. Frequency modulation and television antenna when manufactured by this process are improved in their performance since the reduction in weight permits a larger diameter tube or rod to be used in the element, increasing surface area and consequently pick-up. Multi-element antenna made by this method facilitates their installation and simple supporting structures can be used.

There are places where the costs of plating plastics saves other operations and thereby justifies itself. Aside from this, complicated and intricately shaped items can often be molded in plastic and plated at a fraction of the cost of making the same part in metal. This may also hold true for many heavy diecastings and screw machine parts. Other cost factors which should be considered are that the extensive polishing often necessary to prepare metals for plating is not required in plating plastics. For certain uses, plated plastics because of lower over-all density may show greater resistance to denting and bending.

Possibilities

It is entirely possible that plated plastics may be widely employed for home and automotive hardware, for decorative effects on electrical appliances where weight saving is desired and in many other applications. In the decorative field the uses of plated plastics as metal replacements are almost without limit. Plated plastics can combine the brilliant color which can be achieved with synthetics together with the gleam of metal. Any desired metal finish can be obtained—it is possible to plate partly or entirely—designs may be plated on the plastics base, and any combination of metals can be produced. The use of plated plastics is already widespread in costume jewelry and related fields. Plastic plated buttons are sold and plated plastic caps adorn many perfume bottles.

Practically all types of plastics can be metallized. The electroplater naturally prefers to work on the thermosetting plastics because of their greater stability. Examples are the phenol aldehydes (Bakelite, Catalin, Durex) and the urea and melamine aldehydes (Beetle, Melmac, Plaskon). Certain thermoplastics, in commercial practice, appear to lend themselves somewhat more readily to plating than others. The acrylates and methacrylates (Lucite, Plexiglas), polystyrene (Lustron, Styron), and cellulose acetate (Lumarith, Plastacele, Tenite I) are especially good.

The vinyl group may prove a little more difficult, while the furfurals are satisfactory. As has already been pointed out one point for the plastic fabricator to remember is that plastic objects intended for plating should be designed with that objective in mind. Especially valuable applications have been obtained by the collaboration of engineers versed in the molding of plastics as well as the plating of plastics. In many cases a very minor modification in the design of a plastic part may result in decreased cost, better adhesion and other improvements in the metal coating.

References

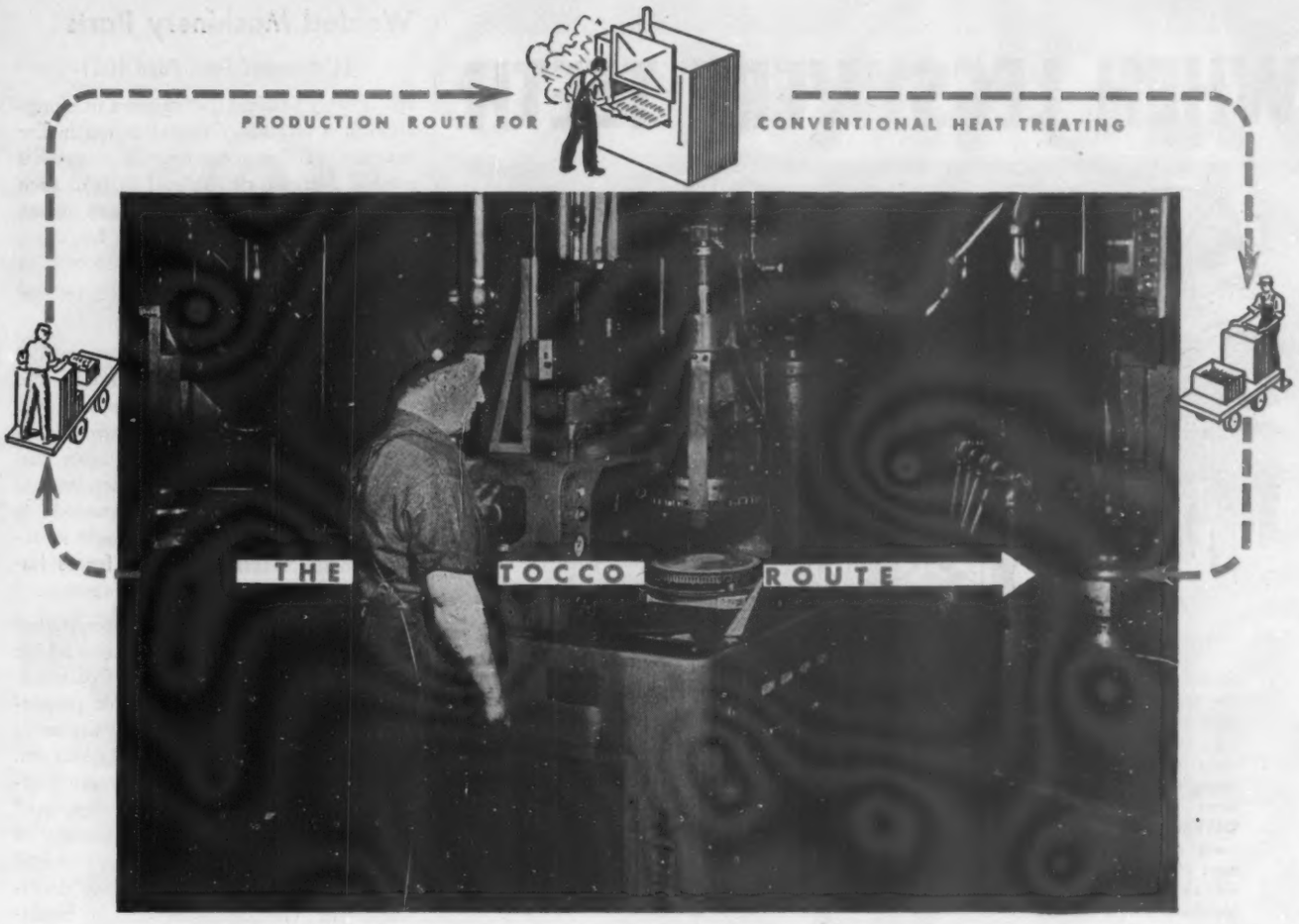
[1]Much of the information presented was supplied by Charles A. Marlies, director of research and development, Metaplast Co., New York.

[2]Tests carried out by Monroe Auto Equipment Co.; *Iron Age* Feb. 1, 1945.

[3]Metaplast Co., New York.

—o—

Contour saw chart devised by Capewell Mfg. Co., Hartford, Conn., shows various kinds of material to be sawed, the tooth to use, and speed recommended for different sizes. This can also be used in straight sawing with hard edge flexible metal cutting band saw blades.



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WILLYS-OVERLAND MOTORS, Inc., reports this time-saving idea in the manufacture of flywheel ring gear assemblies for the famous Jeep:

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The man shown in the picture machines one side of cast iron flywheel in machine at left . . . places it and ring gear in TOCCO work fixture . . . presses TOCCO start button.

The TOCCO machine automatically heats ring gear to 400°F. in 12 seconds, expanding its 12" diameter .025" . . . lowers ring gear and presses it on flywheel . . . quenches ring gear, cooling and shrink-fitting it to flywheel.

A second man removes the assembly from TOCCO and machines other side of flywheel in machine at right.

Since TOCCO almost operates itself, only two men are required for this three-machine set-up.

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In the first practical application of the tooth gear drive, the "pinion" gear was a man, the teeth were his legs, and they meshed in radial steps on a large wheel. From this early conception of drive gears, development has continued up to the OTTUMWA-Sykes generated herringbone gears. This represents the most efficient and economical method extant of transmitting power between shafts whose axes are parallel.

Illustrated below is a typical set of drive gears for rolling mills, fans, rubber mill line shafts, hoists, etc. The teeth on the pinion and the gear, cut by the Sykes gear generator on a 30° helical angle, have full bearing surface and tooth contours true involute.

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Welded Machinery Parts

(*Continued from Page* 102)

28. Purely vertical deformation or elongation is a secondary consideration in the function of this machine. A somewhat normal design for structural parts of such a press is composed of top beam or platen, lower beam or bed, and side housings; all separate pieces integrated by two or four vertical tie rods secured by nuts at both ends.

In such a design it can be seen readily that in addition to vertical, straight line elongation, upper and lower beams will tend to deflect as beams in a manner detrimental to the alignment of tools and work in press. That such detrimental tendency is practically eliminated is shown in this design where single structural member resists working forces imposed on it in direct, uniform tension.

Stabilization of thin and unsupported expanses of metal is a new element which requires watchfulness in design of weldments for machinery, since basic properties of the component materials are more predictable and process limitations on the thinness of metal sections are nonexistent. These thin and unsupported expanses of metal may be detrimental to operation of the machine for several reasons. One is the possibility of "drumming" or vibration, another is fundamental instability, and third is possibility of dents or distortion in normal handling of the structure.

Many possible methods of stabilizing expanses of cross-section exist. Usually, imagination of the designer is fertile in solution of the problem, if it is recognized.

Size Limitation: Generally, the fewer the number of pieces bolted together to make up a machine structure, the less it will weigh and cost, and the stiffer it will be. The only limitations on the size of a weldment are those imposed by stress relieving facilities and shipping clearance.

Another type of freedom that should be kept in mind by designer of weldments is possible use of higher strength, weldable alloys in highly stressed portions of the structure. Secondary components or elements of the piece can be of cheaper, plain carbon steels. Weldable alloys, of course, add nothing in rigidity or stiffness since modulus of elasticity remains practically the same.

Factors of primary importance in the economic balance or competitive comparison of welded steel must be evaluated clearly. Fundamental reason for assuming that a weldment is the proper medium must be unmistakably defined. This reason may include natural adaptability, and predictability, minimum weight and

SIMPLEX

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initial cost. Having established this, it must be realized that the weldment undoubtedly will not resemble a casting in appearance; this does not imply that welded machinery parts will be displeasing. It means simply that anything produced by a radically different process will be different in appearance. If it is not, the design should be reviewed critically because chances are that it is not economical as a weldment.

A simple instance is shown in Fig. 27 where at "a," the common detail of a bolting flange is shown. In a casting, many changes in contour do not affect the cost particularly. In a weldment, such details necessitate a greater number of components and, consequently, larger numbers of manhours to join them. At "b" an alternate detail is shown which fulfills the same function. These are examples of actual applications in use in thousands of weldments.

On the other hand, if weight reduction is of critical importance, the over-all economic balance might dictate added complication in the weldment. A natural question here is, "why not cast it?" The answer has been found to be that if weight reduction is the primary criterion for given requirements of space and over-all size, a weldment can be designed which will weigh less than casting without affecting strength or rigidity. If quantities of duplicate parts are involved, other methods of achieving minimum weight at lowest cost also are available.

In making a decision on value of weldments as structural members in a machine, broad measures of their desirability should be known and considered. A weldment should not be used simply because desire exists to design in this medium. By the same token, casting or forging should not be used if a weldment presents greater advantages.

In this discussion, weight control or reduction may seem to have been emphasized. This is due simply to the progressive recognition of the fact, particularly in relatively large pieces weighing 200 lb or more, that weldments have been applied admirably where weight is important. Inherent features making this possible undoubtedly are predictability and the process imposes practically no limit on thinness of sections. Weight factor can be important in machine design for many reasons. Fundamentally, it is the minimization of inertia forces in moving parts of machinery. Another is the pyramiding of effects of weight or mass in mechanisms subject to high velocity, as in modern railroad passenger cars.

Conclusion: Result of practical application of the many factors discussed probably can be best illustrated by a

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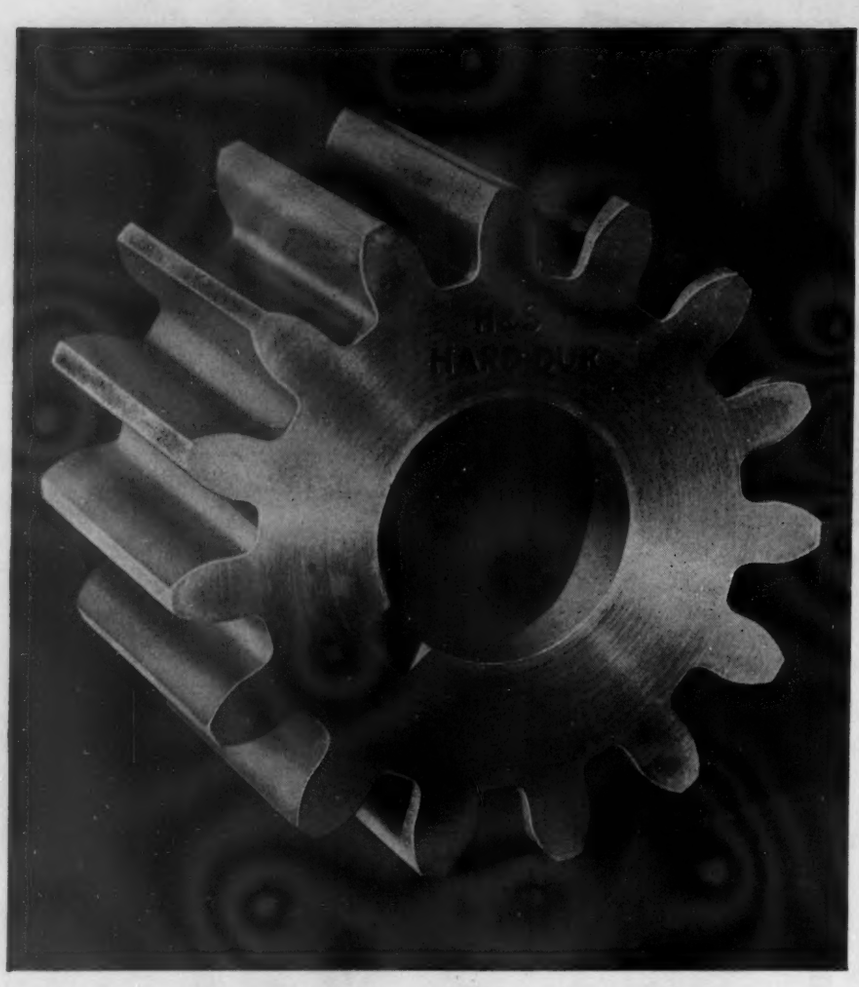
Excellent root penetration with unusually good x-ray welds.

Ask for your *Free Samples* . . . specifying diameter used . . . on your company letterhead . . . to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

Westinghouse
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

FLEXARC ELECTRODES

Send for this new booklet. Gives complete details of SW-2 performance, time and cost reduction. Ask for B-3710.



Harder Tasks become Easier with **"HARD-DUR" GEARS**

★ "HARD-DUR" Gears preserve the tooth form. They are made only of the finest gear steels and are scientifically heat treated to obtain the maximum physical properties. They are so much stronger, harder and more wear-resistant than similar untreated gears that they are guaranteed to have four to five times the life and at only 50 per cent extra in cost.

"HARD-DUR" Gears handle the tough jobs on which ordinary gears fail and when used on the average job they last almost indefinitely.

Send note on Company Letterhead for 488-Page Catalog 41

THE HORSBURGH & SCOTT CO.

GEARS AND SPEED REDUCERS

5112 HAMILTON AVENUE • CLEVELAND, OHIO, U. S. A.

particular instance of weight and space efficiency in use of weldments. A comparison in Fig. 31 of a direct drive four-cycle diesel engine of 1926 with an electrical driven two-cycle diesel engine of today shows that modern, smaller engine represents a reduction of 67.39 per cent in cu ft occupied per bhp, and reduction of 58.40 per cent in weight per bhp. Development of welded steel type construction has materially helped in reducing weight.

At the same time, today's lighter engine is 50 per cent more efficient than the heavier engine of 20 years ago.

Has Ten Times More Power Industrial Air Brake

An industrial brake which operates on ordinary factory airline pressures and yet is capable of exerting as much braking effort as conventional brakes using ten times this pressure has been built by Linderman Devices Inc., Newburgh, N. Y.

The brake is a development from the original Linderman heavy duty automotive brake introduced a number of years ago.

Practically the entire drum (about 90 per cent) is "filled" with lining, which under brake application is pressed radially outward against the drum with the same pressure under each square inch of lining. In this manner, maximum braking effort is obtained with total absence of self-energizing action. This in turn means that braking effort can be accurately and smoothly controlled, without seizing or grabbing, and that lining wear will be evenly distributed for maximum life. Brake thus may be used either to stop or retard industrial equipment or to provide a constant tension or braking effort, according to company. Amount of braking effort exerted, in any case, is directly proportional to the amount of air pressure applied, to the actuating Linderman multi-stage diaphragms. Entire brake is self contained.

Control Radius Grinding Of Electrical Contacts

Cleveland Tungsten Inc., 10200 Meech avenue, Cleveland, has developed a method of radius grinding for electrical contacts by which the radius is controlled and centered. "Floating radii" are virtually eliminated. Cleveland Tungsten also has announced new manufacturing processes which are supposed to make possible much closer tolerances in disks. Also, marked advance has been made toward producing absolutely parallel-faced contacts. This feature is especially valuable in vibrator service.

OUR PRE-WAR REPUTATION:
OUR WAR RECORD:
OUR POST-WAR PLAN:

QUALITY AT LOWEST DOLLAR COST

BUILDING & REPAIRING
BARGES, TUGS
RIVER BOATS
PILE DRIVERS
DREDGES, DERRICKS
COASTAL VESSELS
STRUCTURAL STEEL & TANKS

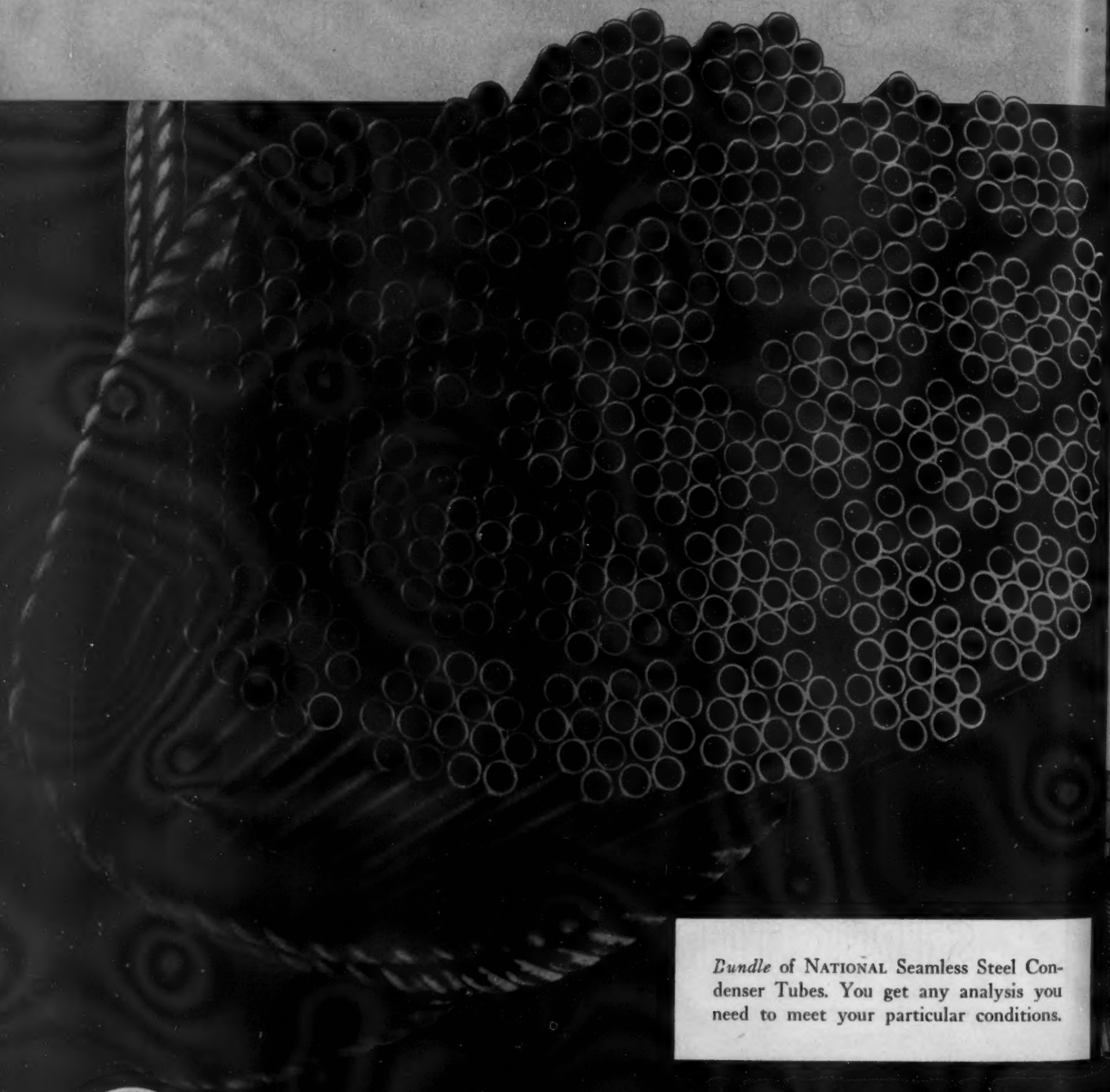
STEEL

AVONDALE MARINE WAYS, INC.

TELEPHONE: OFFICE AND PLANT, WALNUT 8970

RIVER FRONT, NEW ORLEANS DISTRICT, WESTWEGO, LOUISIANA

SEAMLESS



Bundle of NATIONAL Seamless Steel Condenser Tubes. You get any analysis you need to meet your particular conditions.

NATIONAL TUBE COMPANY
USS STEEL
UNITED STATES STEEL

UNITED STATES STEEL

STEEL TUBES

. . . ideal for Condensers and heat exchangers

COMBINE STRENGTH WITH EXCELLENT HEAT FLOW CHARACTERISTICS

STRENGTH of materials is unquestionably the primary consideration in designing modern engineering structures for power generation, refining, chemical processing, etc. Second in importance are problems involving the flow of heat.

High temperatures and pressures currently employed create a combination of conditions that involves *both* of these engineering problems.

Of all the materials that may be fabricated into tubing, none possess the combination of properties that will meet these conditions as well as steel, either in plain form or alloyed with such elements as chrome, copper, nickel or silicon.

The ideal heat transfer apparatus calls for thin-walled tubes with smooth surfaces that offer least resistance to the flow of heat, maximum resistance to pressure, and surfaces that can be readily cleaned.

Varying grades of NATIONAL Seamless Steel Tubing permit selections that will best resist the mechanical stresses set up by internal and external pressure, expansion and contraction, erosion, abrasion, vibration and creep. Steel tubing also permits the best means of attachments to tube sheets either by expanding and rolling or by welding.

When both tubing and other parts of the apparatus are made of steel, no corrosive action, due to electrolysis, is invited.

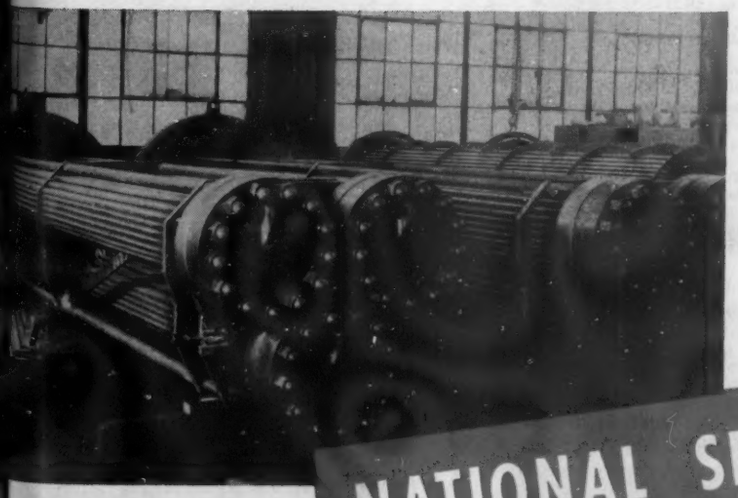
For a complete description of NATIONAL Seamless Steel Condenser and Heat Exchanger Tubes, write for our Bulletin No. 4.

NATIONAL TUBE COMPANY

PITTSBURGH, PA.

Tubing Specialties Division

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York



Why "Walls Without Welds" are Best

By every standard of measurement, the seamless process of tube-making—piercing a solid billet of steel—is admittedly superior. No process of making welded tubes, however ingeniously employed, can fully satisfy the mind that somewhere along the weld, or adjacent thereto, one or more points of weakness do not exist; for no method of joining metals yet devised can provide, with invariable certainty, the structural homogeneity of a solid forging.

EVERY SUNDAY EVENING, United States Steel presents *The Theatre Guild on the Air*. American Broadcasting Company coast-to-coast network. Consult your newspaper for time and station.

NATIONAL SEAMLESS *Steel Tubing*

ABC statement of Material Handling Facts

for busy manufacturers with an eye on the shrinking spread between labor costs and price ceilings . . .

Most management men in industry are aware of the many advantages of mechanizing handling of material in plant and warehouse. The basic facts outlined below deserve the consideration of any executive concerned with this problem.

THE CASE FOR POWER INDUSTRIAL TRUCKS

1. **They conserve manpower.** One operator with a power truck can do the work of 6-10 men with hand trucks.

2. **They conserve time.** Besides speeding transportation of material, they load and unload cars faster, and save time on many other handling operations.

3. **They conserve space.** Fork trucks, Hy-Lift trucks, and crane trucks can tier material to make floor space more valuable.

4. **They promote safety** by eliminating the strained backs, hernias, crushed fingers or toes and other accidents resulting from manual lifting.

5. **They speed production.** By keeping materials moving, bringing work right to machines, keeping aisles clear, fast changing of dies, they reduce idle machine time and step up production schedules.

6. **They are flexible.** Not limited by craneways or tracks, they can operate anywhere —indoors and out—wherever needed.

THE CASE FOR ELECTRIC POWER INDUSTRIAL TRUCKS

1. **Continuous Operation.** Always dependable—always on the job, electric trucks are built for long, hard service. Changing batteries takes less time than changing oil or re-fueling non-electric trucks.

2. **Lowest Maintenance Cost.** Case histories show that with proper care, Baker Trucks can cost their owners as little as $50 per year for maintenance and repair.

3. **Lowest Operating Cost.** Electric power is the cheapest power available for heavy duty industrial truck operation — even with cost of battery depreciation.

4. **Lowest Investment Cost** —when amortized over their many years of useful service. Most electric trucks are still going strong after 15 to 20 years of strenuous service.

5. **Maximum Safety.** Electric power is *safe* power — free from excessive heat, noxious fumes, and dangers of explosion or fire.

6. **Most Efficient Performance.** Smooth starting—powerful acceleration—more positive control—no gear shifting—these are some of the operating advantages of electric trucks.

THE CASE FOR BAKER INDUSTRIAL TRUCKS

1. **Complete Line** for every type of industrial truck handling system. In addition to standard Low-Lift, Hy-Lift, Fork, Crane, and Platform Trucks, Baker makes tractors and a wide variety of special trucks for unusual handling operations. For example, Baker makes an Articulated Fork Truck for operation in narrow aisles and congested areas.

2. **Baker Representatives** in all principal industrial centers are qualified material handling engineers, available for counsel on your material handling requirements. They will help you select the proper equipment for your needs.

3. **Baker Engineering and Service** are dedicated to the continuous operation of all Baker Trucks. Adequate stocks of spare parts are maintained to meet emergencies. Baker representatives are available for consultation and help at all times and factory engineers make periodic field trips throughout the country to insure satisfactory operation and to recommend proper truck care.

4. **Baker Motors** on all Baker Trucks are designed and built by Baker, to give greatest efficiency for their specific functions. Baker Travel Motors develop more horsepower and contain more copper and iron than any other motors of the same size.

5. **Baker Power Axle.** Careful selection of properly heat-treated steels, plus many exclusive design features, practically eliminate service failures and greatly reduce maintenance.

6. **Baker Duplex Compensating Suspension** — an exclusive Baker feature which holds power axle in alignment, and prevents twisting strains due to rough floor conditions from being transmitted to frame or steering rods.

These are a few of the advantages offered by Baker Electric Power Industrial Trucks. For further information, call in your nearest Baker representative, or write us direct.

Member: Electric Industrial Truck Association

BAKER INDUSTRIAL TRUCK DIVISION
of The Baker-Raulang Company
2167 West 25th Street • Cleveland, Ohio
In Canada: Railway and Power Engineering Corp., Ltd.

Baker INDUSTRIAL TRUCKS

X-Ray-Radium Meeting

(*Concluded from Page* 128)

and electric instruments in his report, "The Radiography of Captured Enemy Equipment by the U. S. Navy". The problem in this case was not the development of a method for obtaining high contrast and sensitivity but rather means of developing sufficient latitude to accurately reveal the relationship of the component parts of the instrument which were to be studied.

Properties and uses of various developers were described and comparisons of developer latitute were made. Lt. O'Connor also discussed method of exposure estimation by using film characteristics curves. In the question period that followed it was revealed that stereoscopic radiography had been used to show three-dimensionally the relation of fuse components.

Characteristics of aluminum alloy spot welds as revealed by radiographs were explained by Mr. G. W. Scott, Jr., Armstrong Cork Co. His paper, "Radiography for Development and Control of Aluminum Spotwelding" covered such considerations as voltage, wave-length, types of tubes, and exposures for various aluminum alloys. Satisfactory and unsatisfactory welds were shown as they appear both micro and macroscopically and radiographically. According to Mr. Scott, weld quality can be checked satisfactorily with radiographic studies of the type discussed.

Hand-Bending Tool Will Form Tubing To Any Angle

A hand-bending tool, which permits all kinds of small tubing to be curved to any desired angle, has been developed by Carroll E. Adreon of Glenn L. Martin Co., Baltimore, Md.

Tool consists of a sturdy steel base which may be used in a vise or clamped onto a bench; revolving radius rod equipped with handle for turning; stop block grooved to hold tubing; and movable radius block which guides tubing around bend roll centered on top the base. This roll, cylindrical in shape and also grooved has a top plate scribed in 360°. Measuring point is marked on movable radius block. Radius and holding blocks and roll are so grooved as to prevent crushing or change in section of tubing.

In operation tubing is inserted in the groove of the stop block and the movable block is then pulled around the bend roll, being connected to revolving radius rod, until measuring point is directly opposite mark of angle desired in the bend roll.

FASTER . . . MORE EFFICIENT . . . MORE ECONOMICAL

HYPRESSURE Jenny STEAM CLEANER

With The

New ADJUSTA-BLAST-GUN*

FOR EVERY INDUSTRIAL CLEANING JOB

HYPRESSURE JENNY STEAM CLEANING is the *fastest,* most *thorough,* most *economical* method known for cutting and flushing oil, grease, and dirt, from any surface. Cleaning is accomplished by a highly atomized mixture of steam, hot water and cleaning compound applied under pressure through the ADJUSTA-BLAST-GUN, a light, compact unit which gives the operator instant choice of the right type and the right amount of spray or water for any cleaning requirement. One man, using HYPRESSURE JENNY, can do more cleaning in an hour than 8 men can accomplish in the same time by outmoded hand cleaning methods.

JENNY has many uses and is a time and money saver in any plant or factory. For instance, JENNY STEAM CLEANING of machinery *before* repairs, cuts "down time" practically in half by saving up to 40% of mechanics' time usually lost wiping oil and grease from tools and equipment. JENNY also keeps mill and factory floors clean for safe, rapid plant traffic . . . provides better light by cleaning windows, walls, and skylights . . . lessens fire hazards.

Hundreds of manufacturing plants have adopted HYPRESSURE JENNY as the *fastest, most efficient,* and *most economical* method of doing all their cleaning jobs. There is a JENNY model to suit *your* needs, too. Why not let us send you detailed information and new low prices on JENNY STEAM CLEANERS and JENNY Cleaning Compounds?

*The ADJUSTA-BLAST-GUN

Present HYPRESSURE JENNY users will welcome the new ADJUSTA-BLAST-GUN, because it provides, in one light, compact unit, instant choice of the RIGHT type of spray for most any cleaning job. The operator, at all times, has, right at his finger tips, adjustable control of a spray which may be varied anywhere from HYPRESSURE JENNY'S powerful steam vapor spray for grease and dirt removal, up to an extra powerful 480 gallons per hour flushing or rinsing blast for removing stubborn mud and clay deposits, melting snow and ice, etc. And again, if you want a cold water rinse, a turn of the valve does the trick.

An ADJUSTA-BLAST-GUN, added to your HYPRESSURE JENNY, more than doubles the amount of cleaning work that you will be able to do, at NO INCREASE in the amount of fuel and electricity consumed, and with no mechanism added to the machine. ADJUSTA-BLAST-GUN, price complete, delivered **$35.00**

Hypressure Jenny Division

HOMESTEAD VALVE MFG. CO.

P. O. BOX 22 CORAOPOLIS, PENNA.

the BUSINESS TREND

EFFECT of the steel strike on industrial activity widened last week as dwindling or exhausted steel inventories forced additional metal-consuming plants to curtail operations. Notable among those closing down for this reason is Ford Motor Co., which in the week ended Feb. 9 produced only 4305 automobiles, compared with 14,985 in the previous week. Meanwhile, Chrysler Corp. increased production from 5000 units in the week ended Feb. 2 to 9275 in the week ended Feb. 9. Total production of the automobile industry in the week ended Feb. 9 was 23,785, a decline of 5510 from the preceding week.

STEEL's industrial production index in the week ended Feb. 9 registered 75 per cent (preliminary), showing little change from the 77 per cent of the previous week. Although effects of the steel strike are spreading in metal-consuming plants those effects are not registered in STEEL's index except as they affect electric power consumption, automobile production, and railroad car loadings. Greatest single effect of the steel strike was registered on STEEL's index in the week ended Jan. 26 when steel ingot production dropped to 5 per cent of capacity.

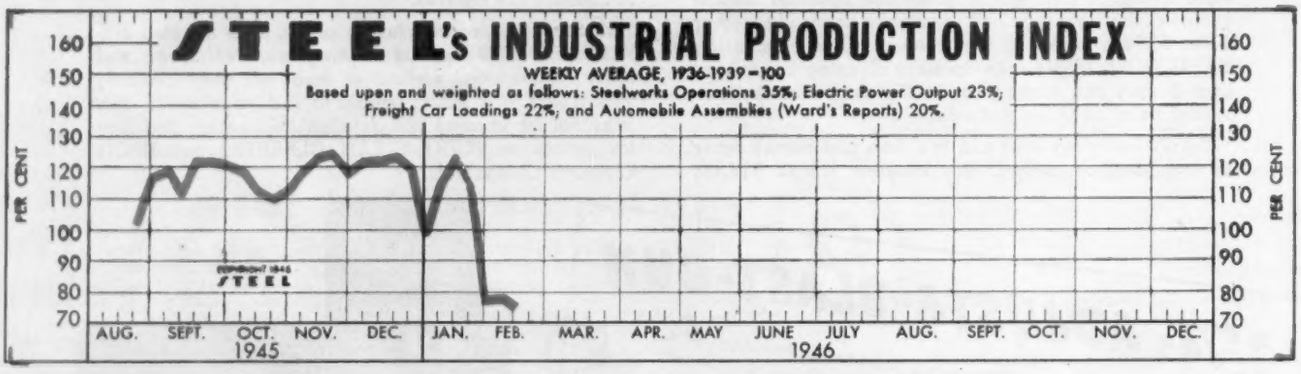
COAL—Bituminous coal production, however, is holding up well, and for the first time since the end of 1944 the year's accumulative output exceeds that for the corresponding period of the preceding year, production through Feb. 2 being 0.1 per cent ahead of that at the corresponding time in 1945. Output in the week ended Feb. 2 was 12½ million tons.

COKE—A 7.8 per cent increase in coke production was registered in December, compared with November. The December output, 5,558,516 tons, consisted of 5,166,081 tons of by-product and 392,435 tons of beehive coke. The December by-product output increased 7.9 per cent over November, while beehive production rose 7.1 per cent.

FABRICATED STRUCTURALS—Bookings of fabricated structural steel for bridge and building construction in 1945 totaled 1,114,087 tons, a 77 per cent rise over the 628,877 tons in 1944. Shipments increased from 597,872 tons in 1944 to 797,441 tons in 1945.

RAILROADS—Estimated net income of Class 1 railroads in 1945 dropped to $453,000,000, 32 per cent under the $667,200,000 of the preceding year. The decline resulted principally from a traffic decline after the end of war, increased operating costs due to higher wages and rising costs of fuel, materials and supplies, and increased charges to operating expenses for accelerated amortization of defense projects.

INCOME—New record for income payments to individuals was set in 1945 when the total reached $160,700,000,000. This is $4 billion above the previous peak of $156,800,000,000 in 1944, and more than double the $76,200,000,000 in prewar 1940.



The Index (see chart above): Latest Week (preliminary) 75 Previous Week 77 Month Ago 123

FIGURES THIS WEEK

INDUSTRY	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	5.5	5.5	82	89.5
Electric Power Distributed (million kilowatt hours)	3,960†	3,983	4,163	4,505
Bituminous Coal Production (daily av.—1000 tons)	2,083	2,087	1,709	1,882
Petroleum Production (daily av.—1000 bbls.)	4,600†	4,609	4,578	4,729
Construction Volume (ENR—Unit $1,000,000)	$55.5	$70.2	$88.0	$20.6
Automobile and Truck Output (Ward's—number units)	23,785	29,295	23,340	20,960

*Dates on request. †Preliminary.

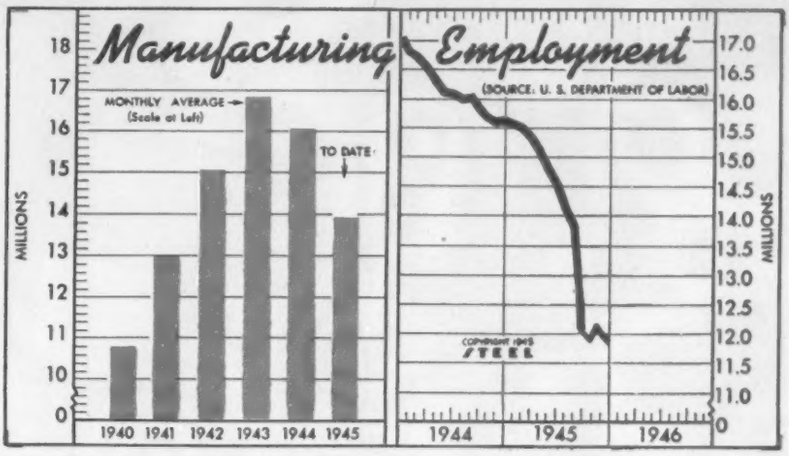
TRADE				
Freight Carloadings (unit 1000 cars)	720†	723	773	755
Business Failures (Dun & Bradstreet, number)	27	31	10	14
Money in Circulation (in millions of dollars)‡	$27,929	$27,914	$28,297	$25,411
Department Store Sales (change from like wk. a yr. ago)‡	+20%	+17%	−7%	+11%

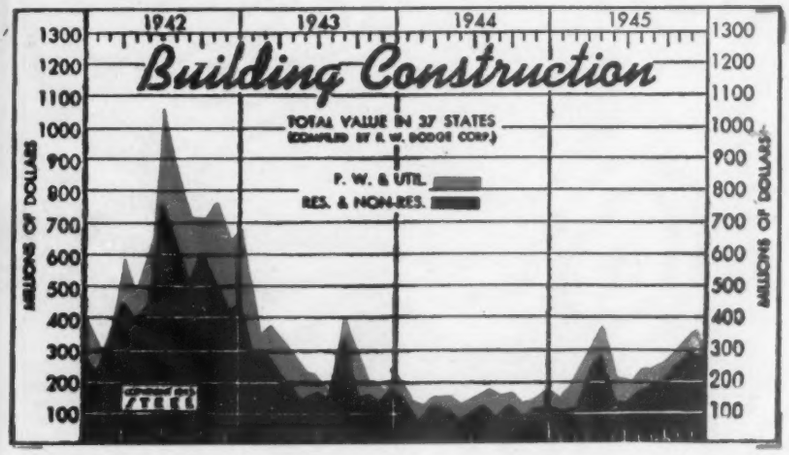
†Preliminary. ‡Federal Reserve Board.

Factory Employment

(000 omitted)

	1945	1944	1943
January	15,555	16,825	16,423
February	15,517	16,735	16,599
March	15,368	16,559	16,747
April	15,102	16,309	16,774
May	14,811	16,122	16,753
June	14,538	16,093	16,908
July	14,130	16,013	17,059
August	13,831	16,023	17,182
September	12,097	15,843	17,136
October	11,941	15,692	17,194
November	11,947	15,607	17,238
December	11,873	15,632	17,080
Monthly Ave.	13,892	16,121	16,924





Construction Valuation in 37 States

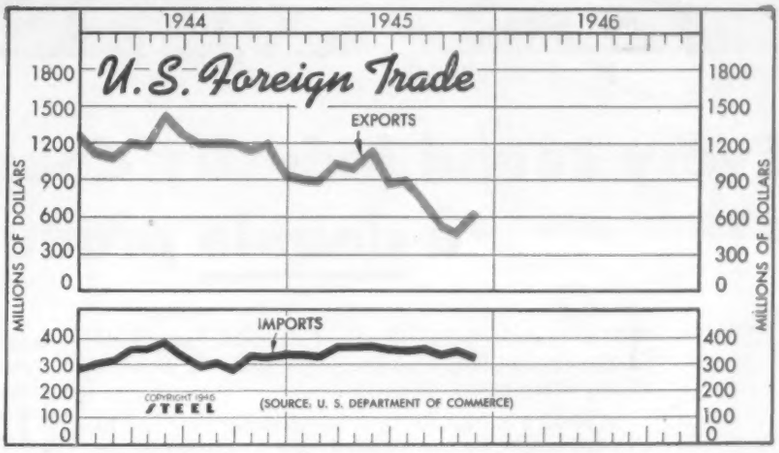
(Unit—$1,000,000)

	Total	Public Works-Utilities		Residential and Non-Residential	
	1945	1945	1944	1945	1944
Jan.	140.9	39.8	50.3	101.2	108.9
Feb.	147.0	32.0	55.1	115.0	82.1
Mar.	328.9	90.6	61.3	238.3	115.1
Apr.	395.8	111.9	72.0	283.9	107.3
May	242.5	107.9	55.8	134.6	88.4
June	227.3	95.0	70.7	132.3	93.1
July	257.7	89.9	80.5	167.8	110.0
Aug.	263.6	77.5	69.4	186.1	99.9
Sept.	278.3	54.6	64.1	223.6	111.6
Oct.	316.6	61.1	52.2	255.5	92.6
Nov.	370.1	74.0	48.0	296.0	116.9
Dec.	330.7	51.0	66.6	279.7	121.8
Tot'l	3,299.4	885.3	746.0	2,414.0	1,247.7

Foreign Trade
Bureau of Foreign and Domestic Commerce

(Unit Value—$1,000,000)

	Exports			Imports		
	1945	1944	1943	1945	1944	1943
Jan.	901	1,124	730	334	300	228
Feb.	882	1,086	719	324	313	234
Mar.	1,030	1,197	988	365	359	249
Apr.	1,002	1,182	980	366	359	258
May	1,133	1,419	1,085	372	386	281
June	866	1,271	1,002	360	330	295
July	893	1,198	1,262	356	293	300
Aug.	737	1,207	1,204	360	302	315
Sept.	515	1,199	1,235	335	280	285
Oct.	455	1,140	1,195	344	327	329
Nov.	638	1,184	1,074	322	322	317
Dec.	....	934	1,244	...	336	281
Total	....	14,141	12,718	...	3,907	3,372



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	$11,738	$11,862	$13,171	$11,016
Federal Gross Debt (billions)	$279.4	$279.2	$278.6	$233.9
Bond Volume, NYSE (millions)	$34.8	$34.6	$50.6	$48.5
Stocks Sales, NYSE (thousands)	8,754	12,921	12,290	8,112
Loans and Investments (billions)†	$68.2	$68.1	$67.9	$59.2
United States Gov't. Obligations Held (millions)†	$49,656	$49,531	$48,674	$44,257

†Member banks, Federal Reserve System.

PRICES

STEEL's composite finished steel price average	$58.27	$58.27	$58.27	$57.55
All Commodities†	106.8	106.8	106.8	104.7
Industrial Raw Materials†	118.9	119.0	119.7	115.3
Manufactured Products†	102.9	102.9	102.6	101.6

†Bureau of Labor Statistics Index, 1926 = 100.

Every sound industry does a double production job

THE manufacturing plants of America have made more good things for more people than the factories of any other nation on earth.

To make a market for their merchandise they had to pay fair wages, for every manufacturer's employees are the next manufacturer's customers.

And so each industry, *by keeping men and money at work*, made more than merchandise . . . each also made a definite contribution towards a strong and prosperous United States.

Under this economic system . . . free employment of men and money . . . America has grown great. Other countries have tried government subsidies, official controls, artificial checks and regulations. None of these has ever produced nearly as much for so many as the free American way.

We believe this time-tested industrial system must be maintained, and we believe in the important part management plays in maintaining it.

Here at Mullins we deeply feel our share of this responsibility. We manufacture Youngstown Kitchens, large steel stampings and porcelain enameled equipment. By making the best products we can, and selling them at reasonable prices, we do our small part in keeping men and dollars profitably employed.

In this way, we produce our part of national prosperity, and every other manufacturer, whether he thinks of it or not, makes his contribution in a similar way.

If you believe this is a sound view of industry, you may be interested in a booklet we have distributed to our employees, "Not by Bread Alone". It discusses, in a simple way, some of our ideas about the true relationship between industry and general prosperity. Your request will bring a copy, and if you think it would interest your own employees, let us know.

MULLINS MANUFACTURING CORPORATION, Salem, Ohio

Mullins

DESIGN ENGINEERING SERVICE • LARGE PRESSED METAL PARTS • PORCELAIN ENAMELED PRODUCTS

Have you investigated the possibilities of this proved-in-service Stainless Steel for your products?

If steel is to be part of your product, consider the ability of *stainless steel* to do a better job . . . and if stainless is your choice, make *Superior Stainless Strip Steel* your first specification. • The complete range of Superior Stainless types and grades, produced by specialists to high precision standards, is discussed in detail in our new 28-page Brochure. May we send you a copy?

Superior Steel CORPORATION

Carnegie, Pennsylvania

Gear Finishing

Gear Cutting

THE GEAR CUTTING TWINS

Ever since the introduction of crossed-axis gear finishing, there has been a crying need for a gear cutting machine which could keep pace—gear for gear—with the output of gear finishers like the Michigan 900.*

This need has now been filled with the introduction of the new line of Michigan SHEAR-SPEED gear shapers which will cut gears as accurately as they can be cut by *any* high production gear cutting machine and cut them *as fast as you can finish them.*

One SHEAR-SPEED and one Michigan Gear Finisher thus represent a gear-cutting "UNIT". You can now plan your gear production in "Units" per hour or per day.

In addition, you save countless machine hours, and produce better gears at lower cost.

For further information on the GEAR CUTTING TWINS, ask for Bulletins:

#1800-45—describing the new SHEAR-SPEED machine

#900-44—covering the Michigan 900 Gear Finisher*

*Rotary gear finishers also available. For recommendation of type best suited to your needs specify your gear production requirements.

ORIGINATORS of GEAR SHAVING

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD DETROIT 12, U. S. A.

MARKET SUMMARY

Many Obstacles To Prevent Quick Recovery in Steel

Estimates name month as lag to near normal . . .
Heavy demand for all products will follow . . .
Mills slow to make promises

LATE estimates indicate that steel producers will require an average of three weeks to a month to get back to normal production after the strike and in the case of some large units where management has not been permitted by strikers to provide maintenance much longer will be required, two months in some instances.

So uncertain is the nature of damage incurred that some producers will not know definitely how long will be required to make repairs until they are actually in production. Where mills produce only one product, plates for instance, normal operations may be restored within a couple of weeks, but as to the industry in general estimates are less optimistic than recently. Once agreement is reached by the Steel Corporation and CIO, it is believed probable in some quarters that the steelworkers union will call off all strikes at other plants, permitting men to return to work while contract negotiations are being concluded by the independents. This is predicated on a belief that steel producers generally will follow the pattern of the Steel Corporation contract on major issues, leaving little if anything that cannot readily be worked out while production is being resumed. This would preclude delays in getting into production, which would otherwise develop while independent company contracts are being negotiated.

While steel producers will have many problems when labor peace is restored they will be flooded with demands from their own customers for steel already on order. Mills had relatively little finished tonnage unshipped when the strike was called and while stocks of semifinished and steel in process were substantially larger it will require some time before even these can be converted into finished products. As a result tonnage available for fabrication during the first month or so will be light and pressure from consumers strong. Some producers of diversified products declare they are out of the market for the entire year on everything except a few specialties and are booking nothing for 1947. One producer who has been able to operate through the strike appears to be in this position, among others.

Plate demand has eased as impossibility of obtaining delivery promises has become more evident but some producers have booked tonnage greater than capacity lost during the strike. Deliveries now possible vary from six months to first quarter next year. Inquiry for 34,500 tons of plates for three Maritime Commission ships has met refusal by some producers to bid, as firm prices are asked and under present circumstances this is difficult.

Sheetmakers are slow to make definite commitments on future shipments, nearest approach being to name a period of months after the end of the steel strike, some not being able to do even that. Some producers are covered for the year.

Steelmaking last week showed no appreciable change from the prior week, the estimated national ingot rate remaining at 5.5 per cent of capacity. The only change was a drop of ½-point at Chicago, to 4.5 per cent, not sufficient to alter the national rate. Cleveland, Birmingham, Youngstown and Buffalo were shut down entirely. Pittsburgh maintained 1.5 per cent unchanged, Wheeling 56 per cent, Cincinnati 44 per cent, Detroit 32, St. Louis 19, New England 10 and eastern Pennsylvania 6.

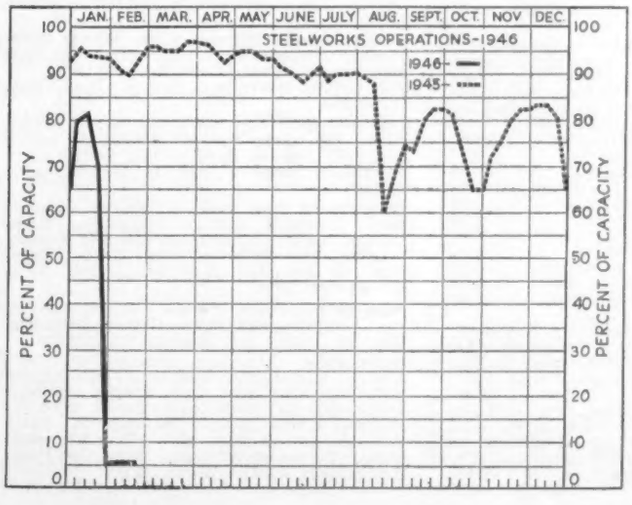
In spite of the fact that practically no scrap is being consumed in manufacture of steel demand continues strong and supply light. Every means is being followed to assure as much supply as possible for use as soon as the steel strike ends and storage wherever possible is being done. Prices are maintained at ceilings, without signs of weakness anywhere. Foundries seeking cast grades to eke out short pig iron supply find difficulty obtaining much tonnage. In some cases dealers are preparing scrap for consumers and retaining it in yards for shipment later. Heavy demand is expected when steelmaking is resumed, in spite of such inventories as have been accumulated during the idle period.

DISTRICT STEEL RATES

(Percentage of Ingot Capacity Engaged in Leading Districts)

	Week Ended Feb. 16	Change	Same Week 1945	Same Week 1944
Pittsburgh	1.5	None	84	99
Chicago	4.5	—0.5	99.5	101.5
Eastern Pa.	6	None	91	94
Youngstown	0	None	89	95
Wheeling	56	None	97.5	92
Cleveland	0	None	86.5	93.5
Buffalo	0	None	90.5	90.5
Birmingham	0	None	95	95
New England	10	None	90	85
Cincinnati	44	None	96	92
St. Louis	19	None	80	82
Detroit	32	None	88	91
Estimated national rate	5.5	None	93	98.5

*Based on steelmaking capacities as of these dates.



COMPOSITE MARKET AVERAGES

	Feb. 16	Feb. 9	Feb. 2	One Month Ago Jan. 1946	Three Months Ago Nov. 1945	One Year Ago Feb. 1945	Five Years Ago Feb. 1941
Finished Steel	$58.27	$58.27	$58.27	$58.27	$58.27	$57.55	$56.73
Semifinished Steel	37.80	37.80	37.80	37.80	37.80	36.00	36.00
Steelmaking Pig Iron	24.80	24.80	24.80	24.80	24.25	23.55	22.05
Steelmaking Scrap	19.17	19.17	19.17	19.17	19.17	19.17	20.05

Finished Steel Composite:—Average of industry-wide prices on sheets, strips, bars, plates, shapes, wire nails, tin plate, standard and line pipe. Semifinished Steel Composite:—Average of industry-wide prices on billets, slabs, sheet bars, skelp and wire rods. Steelmaking Pig Iron Composite:—Average of basic pig iron prices at Bethlehem, Birmingham, Buffalo, Chicago, Cleveland, Neville Island, Granite City and Youngstown. Steelworks Scrap Composite:—Average of No. 1 heavy melting steel prices at Pittsburgh, Chicago and eastern Pennsylvania. Finished steel, net tons; others, gross tons.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for last Month, Three Months and One Year Ago

Finished Material, cents per lb.; coke, dollars per net ton; others dollars per gross ton.

Finished Material	Feb. 16, 1946	Jan., 1946	Nov., 1945	Feb., 1945
Steel bars, Pittsburgh	2.25c	2.25c	2.25c	2.15c
Steel bars, Philadelphia	2.57	2.57	2.57	2.47
Steel bars, Chicago	2.25	2.25	2.25	2.47
Shapes, Pittsburgh	2.10	2.10	2.10	2.10
Shapes, Philadelphia	2.215	2.215	2.215	2.215
Shapes, Chicago	2.10	2.10	2.10	2.10
Plates, Pittsburgh	2.25	2.25	2.25	2.20
Plates, Philadelphia	2.30	2.30	2.30	2.25
Plates, Chicago	2.25	2.25	2.25	2.20
Sheets, hot-rolled, Pittsburgh	2.20	2.20	2.20	2.20
Sheets, cold-rolled, Pittsburgh	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Pittsburgh	3.70	3.70	3.70	3.65
Sheets, hot-rolled, Gary	2.20	2.20	2.20	2.20
Sheets, cold-rolled, Gary	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Gary	3.70	3.70	3.70	3.65
Hot-rolled Strip, Pittsburgh	2.10	2.10	2.10	2.10
Cold-rolled strip, Pittsburgh	2.80	2.80	2.80	2.80
Bright bess., basic wire, Pittsburgh	2.75	2.75	2.75	2.60
Wire nails, Pittsburgh	2.90	2.90	2.90	2.80
Tin plate, per base box, Pittsburgh	$5.00	$5.00	$5.00	$5.00
Semifinished Material				
Sheet bars, Pittsburgh, Chicago	$36.00	$36.00	$36.00	$34.00
Slabs, Pittsburgh, Chicago	36.00	36.00	36.00	34.00
Rerolling billets, Pittsburgh	36.00	36.00	36.00	34.00
Wire rods, No. 5 to 9/32-inch, Pitts.	2.15	2.15	2.15	2.00

Pig Iron	Feb. 16, 1946	Jan., 1946	Nov., 1945	Feb., 1945
Bessemer, del. Pittsburgh	$26.94	$26.94	$26.94	$25.69
Basic, Valley	25.25	25.25	25.25	24.00
Basic, eastern del. Philadelphia	27.09	27.09	27.09	25.84
No. 2 fdry., del. Pitts., N.&S. Sides	26.44	26.44	26.44	25.19
No. 2 foundry, Chicago	25.75	25.75	25.75	24.50
Southern No. 2, Birmingham	22.13	22.13	22.13	20.88
Southern No. 2 del. Cincinnati	26.05	26.05	26.05	24.80
No. 2 fdry., del. Philadelphia	27.59	27.59	27.59	26.34
Malleable, Valley	25.75	25.75	25.75	24.50
Malleable, Chicago	25.75	25.75	25.75	24.50
Lake Sup., charcoal del. Chicago	37.34	37.34	37.34	37.34
Gray forge, del. Pittsburgh	25.94	25.94	25.94	24.69
Ferromanganese, del. Pittsburgh	140.00	140.00	140.00	140.33
Scrap				
Heavy melting steel, No. 1, Pittsburgh	$20.00	$20.00	$20.00	$20.00
Heavy melt, steel, No. 2, E. Pa.	18.75	18.75	18.75	18.75
Heavy melting steel, Chicago	18.75	18.75	18.75	18.75
Rails for rolling, Chicago	22.25	22.25	22.25	22.25
No. 1 cast, Chicago	20.00	20.00	20.00	20.00
Coke				
Connellsville, furnace ovens	$7.50	$7.50	$7.50	$7.00
Connellsville, foundry ovens	8.25	8.25	8.25	7.75
Chicago, by-product fdry., del.	13.35	13.75	13.75	13.35

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

Following are maximum prices established by OPA Schedule No. 6 issued April 16, 1941, revised June 20, 1941, Feb. 4, 1942 and May 21, 1945. The schedule covers all iron or steel ingots, all semifinished iron or steel products, all finished hot-rolled, cold-rolled iron or steel products and any iron or steel product which is further finished by galvanizing, plating, coating, drawing, extruding, etc., although only principal established basing points for selected products are named specifically. Seconds and off-grade products are also covered. Exceptions applying to individual companies are noted in the table. Finished steel quoted in cents per pound.

tives at 2.65c, Mansfield, Mass., plus freight on hot-rolled bars from Buffalo to Mansfield.)

Cold-Finished Alloy Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 3.35c; Detroit, del. 3.45c; Eastern Mich. 3.50c.

Reinforcing Bars (New Billet): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Sparrows Point, Buffalo, Youngstown, base 2.15c; Detroit del. 2.25c; Eastern Mich. and Toledo 2.30c; Gulf ports, dock 2.50c; Pacific ports, dock 2.55c.

Reinforcing Bars (Rail Steel): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Buffalo base 2.15c; Detroit, del. 2.25c; Eastern Mich. and Toledo 2.30c; Gulf ports, dock 2.50c.

Iron Bars: Single refined, Pitts, 4.40c; double refined 5.40c; Pittsburgh, staybolt, 5.75c; Terre Haute, single ref., 5.00, double ref., 6.25c.

Sheets, Strip

Hot-Rolled Sheets: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Buffalo, Youngstown, Sparrows Pt., Middletown, base 2.20c; Granite City, base 2.30c; Detroit del. 2.30c; Eastern Mich. 2.35c; Phila. del. 2.37c; New York del. 2.44c; Pacific ports 2.75c.

(Andrews Steel Co. may quote hot-rolled sheets for shipment to Detroit and the Detroit area on the Middletown, O., base; Alan Wood Steel Co., Conshohocken, Pa., may quote 2.35c on hot carbon sheets, nearest eastern basing point.)

Cold-Rolled Sheets: Pittsburgh, Chicago, Cleveland, Gary, Buffalo, Youngstown, Middletown, base, 3.05c; Granite City, base 3.15c; Detroit del. 3.15c; Eastern Mich. 3.20c; New York del. 3.39c; Phila. del. 3.37c; Pacific ports 3.70c.

Galvanized Sheets, No. 24: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Youngstown, Sparrows Point, Middletown, base 3.70c; Granite City, base 3.80c; New York del. 3.94c; Phila. del. 3.78c; Pacific ports 4.25c.

(Andrews Steel Co. may quote galvanized sheets 3.75c at established basing points.)

Corrugated Galv. Sheets: Pittsburgh, Chicago, Gary, Birmingham, 29 gage, per square 3.36c.

Culvert Sheets: Pittsburgh, Chicago, Gary, Birmingham, 16 gage not corrugated, copper alloy 3.60c; Granite City 3.70c; Pacific ports 4.25c; copper iron, 3.90c; pure iron 3.95c; zinc-coated, hot-dipped, heat-treated, No. 24, Pittsburgh, 4.25c.

Wire Rods: Pittsburgh, Chicago, Cleveland, Birmingham, 5—9/32 in. inclusive, per 100 lbs., $2.15 Do., over 9/32—42-in., incl., $2.30; Galveston, base, 2.25c and 2.40c respectively. Worcester add $0.10; Pacific ports $0.50 (Pittsburgh Steel Co., $0.05 higher.)

Bars

Hot-Rolled Carbon Bars and Bar-Size Shapes under 3: Pittsburgh, Youngstown, Chicago Gary, Cleveland, Buffalo, Birmingham base 20 tons one size, 2.25c; Duluth, base 2.35c; Detroit, del. 2.35c; Eastern Mich. 2.40c; New York del. 2.59c; Phila. del. 2.57c; Gulf Ports, dock 2.62c; Pac. ports, dock 2.90c, (Calumet Steel Division. Borg-Warner Corp., and Joslyn Mfg. & Supply Co., may quote 2.55c, Chicago base; Sheffield Steel Corp., 2.75c, f.o.b. St. Louis.)

Rail Steel Bars: Same prices as for hot-rolled carbon bars except base is 5 tons. (Sweet's Steel Co., Williamsport, Pa., may quote rail steel merchant bars 2.33c f.o.b. mill.)

Hot-Rolled Alloy Bars: Pittsburgh, Youngstown, Chicago, Canton, Massillon, Buffalo, Bethlehem base 20 tons one size, 2.70c; Detroit del., 2.80c. (Texas Steel Co. may use Chicago base price as maximum f.o.b. Fort Worth, Tex., price on sales outside Texas, Oklahoma.)

AISI Series	(*Basic O-H)	AISI Series	(*Basic O-H)
1300	$0.10	4100 (.15-.25 Mo)	0.70
		4100 (.20-.30 Mo)	0.75
2300	1.70	4300	1.70
2500	2.55	4600	1.20
3000	0.50	4800	2.15
3100	0.85	5100	0.35
3200	1.35	5130 or 5152	0.45
3400	3.20	6120 or 6152	0.95
4000	0.45-0.55	6145 or 6150	1.20

* Add 0.25 for acid open-hearth; 0.50 electric.

Cold-Finished Carbon Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 20,000-39,999 lbs., 2.75c; Detroit 2.80c; Toledo 2.90c. (Keystone Drawn Steel Co. may sell outside its usual market area on Proc. Div., Treasury Dept. contracts at 2.65c, Spring City, Pa., plus freight on hot-rolled bars from Pittsburgh to Spring City, New England Drawn Steel Co. may sell outside New England on WPB directives; Empire Sheet & Tin Plate Co., Mansfield, O., carbon sheet bars, $39, f.o.b. mill.)

Skelp: Pittsburgh, Chicago, Sparrows Point, Youngstown, Coatesville, lb., 1.90c.

Semifinished Steel

Gross ton basis except wire rods, skelp.

Carbon Steel Ingots: F.o.b. mill base, rerolling qual., stand. analysis, $31.00.

(Empire Sheet & Tin Plate Co., Mansfield, O. may quote carbon steel ingots at $33 gross ton, f.o.b. mill).

Alloy Steel Ingots: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon; uncrop, $45.

Rerolling Billets, Blooms, Slabs: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Sparrows Point, Birmingham, Youngstown, $36; Detroit, del. $38; Duluth (bil) $38; Pac. Ports, (bil) $48. (Andrews Steel Co., carbon slabs $41; Continental Steel Corp., billets $34, Kokomo, to Acme Steel Co.; Northwestern Steel & Wire Co., $41, Sterling, Ill.; Laclede Steel Co., $34 Alton or Madison, Ill.; Wheeling Steel Corp. $36 base, billets for lend-lease, $34, Portsmouth, O., on slabs on WPB directives. Granite City Steel Co. $47.50 gross ton slabs from D.P.C. mill. Geneva Steel Co. $58.64, Pac. ports.)

Forging Quality Blooms, Slabs, Billets: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, Youngstown, $42, Detroit, del. $44; Duluth, billets, $44; forg. bil. f.o.b. Pac. ports, $54.

(Andrews Steel Co. may quote carbon forging billets $50 gross ton at established basing points; Follansbee Steel Corp., $49.50 f.o.b. Toronto, O. Geneva Steel Co. $64.64, Pacific ports.)

Open Hearth Shell Steel: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Youngstown, Birmingham, base 1000 tons one size and section; 3-12 in., $52; 12-18 in., excl., $54.00; 18-in. and over $56. Add $2.00 del. Detroit; $3.00 del. Eastern Mich.

Alloy Billets, Slabs, Blooms: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon. $54, del. Detroit $56, Eastern Mich. $57.

Sheet Bars: Pittsburgh, Chicago, Cleveland, Buffalo, Canton, Sparrows Point, Youngstown, $36. (Wheeling Steel Corp. $37 on lend-lease sheet bars, $38 Portsmouth, O., on WPB directives; Empire Sheet & Tin Plate Co., Mansfield, O., carbon sheet bars, $39, f.o.b. mill.)

Enameling Sheets: 10-gage: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, base 2.85c; Granite City, base 2.95c; Detroit, del. 2.95c; eastern, Mich. 3.00c; Pacific ports 3.50c; 20 gage: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, base 3.45c; Detroit del. 3.55c; eastern Mich. 3.60c; Pacific ports 4.10c.

Electrical Sheets No. 24:

	Pittsburgh Base	Pacific Ports	Granite City
Field grade	3.30c	4.05c	3.30c
Armature	3.65c	4.40c	3.75c
Electrical	4.15c	4.90c	4.25c
Motor	5.05c	5.80c	5.15c
Dynamo	5.75c	6.50c	5.85c
Transformer			
72	6.25c	7.00c	....
65	7.25c	8.00c	....
58	7.75c	8.50c	....
52	8.55c	9.30c	....

Hot-Rolled Strip: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Middletown, base 1 ton and over, 12 inches wide and less 2.10c; Detroit del. 2.20c; Eastern Mich. 2.25c; Pacific ports 2.75c.

Cold Rolled Strip: Pittsburgh, Cleveland, Youngstown, 0.25 carbon and less 2.80c; Chicago, base 2.90c; Detroit, del. 2.90c; Eastern Mich. 2.95c; Worcester base 3.00c.

Commodity C. R. Strip: Pittsburgh, Cleveland, Youngstown, base 3 tons and over, 2.95c; Chicago 3.05c; Detroit del. 3.05c; Eastern Mich. 3.10c; Worcester base 3.35c.

Cold Finished Spring Steel: Pittsburgh, Cleveland bases, add 20c for Worcester; .26-.50 Carb., 2.80c; .51-.75 Carb., 4.30c; .76-1.00 Carb., 6.15c; over 1.00 Carb., 8.35c.

Tin, Terne Plate

Tin Plate: Pittsburgh, Chicago, Gary. 100-lb. base box, $5.00; Granite City, Birmingham, Sparrows Point, $5.10.

Electrolytic Tin Plate: Pittsburgh, Gary, 100-lb. base box, 0.25 lb. tin, $4.35; 0.50 lb tin, $4.50; 0.75 lb. tin $4.65; Granite City, Birmingham, Sparrows Point, $4.45, $4.60, $4.75, respectively.

Tin Mill Black Plate: Pittsburgh, Chicago, Gary, base 29 gage and lighter, 3.05c; Granite City, Birmingham, Sparrows Point, 3.15c; Pacific ports, boxed, 4.05c.

Long Ternes: Pittsburgh, Chicago, Gary, No. 24 unassorted 3.80c; Pacific ports 4.55c.

Manufacturing Ternes: (Special Coated) Pittsburgh, Chicago, Gary, 100-base box $4.30; Granite City, Birmingham, Sparrows Point, $4.40.

Plates

Roofing Ternes: Pittsburgh base per package 112 sheets; 20 x 28 in., coating I. C. 8-lb. $12.00; 15-lb. $14.00; 20-lb. $15.00; 25-lb. $16; 30-lb. $17.25; 40-lb. $19.50.

Carbon Steel Plates: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Sparrows Point, Coatesville, Claymont, 2.25c; New York, del. 2.44c; Phila., del. 2.30c; St. Louis, 2.49c; Boston, del. 2.57-82c; Pacific ports, 2.80c; Gulf ports, 2.60c.

(Granite City Steel Co. may quote carbon plates 2.35c f.o.b. mill; 2.65c f.o.b. D.P.C. mill; Central Iron & Steel Co. 2.50c f.o.b. basing points; Geneva Steel Co., Provo, Utah, 3.20c f.o.b. Pac. ports.)

Floor Plates: Pittsburgh, Chicago, 3.50c; Pacific ports, 4.15c; Gulf ports, 3.85c.

Open-Hearth Alloy Plates: Pittsburgh, Chicago, Coatesville, 3.50c; Gulf ports 3.95c; Pacific ports 4.15c.

Shapes

Structural Shapes: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Bethlehem, 2.10c; New York, del. 2.27c; Phila., del. 2.215c; Pacific ports, 2.75c; Gulf ports, 2.45c.

(Phoenix Iron Co., Phoenixville, Pa., may quote the equivalent of 2.45c, Bethlehem, Pa., on the general range and 2.55c on beams and channels from 4 to 10 inches.)

Steel Piling: Pittsburgh, Chicago, Buffalo, 2.40c; Pacific ports, 2.95c.

Wire Products, Nails

Wire: Pittsburgh, Chicago, Cleveland, Birmingham to manufacturers in carloads.

Bright, basic, bessemer wire	*$2.75
Spring wire	*†$3.35

Wire Products to the Trade:

Standard and cement-coated wire nails, and staples, 100-lb. keg, Pittsburgh, Chicago, Birmingham, Cleveland, $2.90; Pac. ports, $3.40; galvanized, $2.55 and $3.05, resp.	
Annealed Merchant quality wire, 100-lb., Pittsburgh, Chicago, Cleveland, Birmingham	††$3.20
Galvanized Merchant quality wire, 100-lb., Pittsburgh, Chicago, Cleveland, Birmingham	††$3.55
Woven fence, 15½ gage and heavier, per base column	67

Barbed wire, 80-rod spool, Pittsburgh, Chicago, Cleveland, Birmingham, column 72; twisted barbless wire, column 72.

*Add $0.10 for Worcester, $0.05 for Duluth; add $0.50 for bright, annealed, galvanized and $0.70 for other finishes for Pacific ports.

†Same bases as for bright basic except Birmingham.

††Add 10 cents for Worcester; 50 cents for annealed, bright basic and 70 cents for all other finishes for Pacific ports.

Tubular Goods

Welded Pipe: Base price in carloads, threaded and coupled to consumers about $200 per net ton. Base discounts on steel pipe Pittsburgh and Lorain, O.; Gary, Ind. 2 points less on lap weld, 1 point less on butt weld. Pittsburgh base only on wrought iron pipe.

Butt Weld

In.	Steel Blk.	Steel Galv.	In.	Iron Blk.	Iron Galv.
⅛	56	33	½	24	3½
¼ & ⅜	59	40½	¾	30	10
½	63½	51	1-1¼	34	16
¾	66½	55	1½	38	18½
1-3	68½	57½	2	37½	18

Lap Weld

In.	Steel Blk.	Steel Galv.	In.	Iron Blk.	Iron Galv.
2	61	49½	1¼	23	3½
2½-3	64	54½	1½	28½	10
3½-6	66	54½	2	30½	12
7-8	65	52½	2½-3½	31½	14½
9-10	64½	52	4	33½	18
11-12	63½	51	4½-8	32½	17
			9-12	28½	12

Boiler Tubes: Net base prices per 100 feet f.o.b. Pittsburgh in carload lots, minimum wall, cut lengths 4 to 24 feet, inclusive.

O.D. sizes	B.W.G.	—Seamless— Hot Rolled	Cold Drawn	—Lap Weld— Steel	Charcoal Iron
1"	13	.....	$ 9.01	.....	.....
1¼"	13	.....	10.67	.....	.....
1½"	13	$10.23	11.72	$ 9.72	23.71
1¾"	13	11.64	13.42	11.06	22.93
2"	13	13.04	15.03	12.38	19.35
2¼"	13	14.54	16.76	13.79	21.63
2¼"	12	16.01	18.45	15.16	.....
2½"	12	17.54	20.21	16.58	26.57
2¾"	12	18.59	21.42	17.54	29.00
3"	12	19.50	22.48	18.35	31.38
3½"	11	24.63	28.37	23.15	39.81
4"	10	30.54	35.20	28.66	49.90
4½"	10	37.35	43.04	35.22	.....
5"	9	46.87	54.01	44.25	73.93
6"	7	71.96	82.93	68.14	.....

Rails, Supplies

Standard rails, over 60-lb., f.o.b. mill, gross ton, $43.00. Light rails (billet), Pittsburgh, Chicago, Birmingham, gross ton, $45.00.

*Relaying rails, 35 lbs. and over, f.o.b. railroad and basing points, $31-$33.

Supplies: Track bolts, 4.75c; heat treated. 5.00c. Tie plates $46 net ton, base, Standard spikes, 3.25c.

*Fixed by OPA Schedule No. 46, Dec. 15, 1941.

Tool Steels

Tool Steels: Pittsburgh, Bethlehem, Syracuse, Canton, O., Dunkirk, N. Y., base, cents per lb.; Reg. carbon 14.00c; extra carbon 18.00c; special carbon 22.00c; oil-hardening 24.00c; high car.-chr. 43.00c

Tung	Chr.	Van.	Moly.	Base, per lb.
18.00	4	1	...	67.00c
1.5	4	1	8.5	54.00c
.....	4	2	3	54.00c
6.40	4.15	1.90	5	57.50c
5.50	4.50	4	4.50	70.00c

Stainless Steels

Base, Cents per lb.

Type	Bars	Plates	Sheets	H. R. Strip	C. R. Strip
CHROMIUM NICKEL STEEL					
302	24.00c	27.00c	34.00c	21.50c	28.00c
303	26.00	29.00	36.00	27.00	33.00
304	25.00	29.00	36.00	23.50	30.00
308	29.00	34.00	41.00	28.50	35.00
309	36.00	40.00	47.00	37.00	47.00
310	49.00	52.00	53.00	48.75	56.00
312	36.00	40.00	49.00	.....	.....
*316	40.00	44.00	48.00	40.00	48.00
†321	29.00	34.00	41.00	29.25	38.00
‡347	33.00	38.00	45.00	33.00	42.00
431	19.00	22.00	29.00	17.50	22.50
STRAIGHT CHROMIUM STEEL					
403	21.50	24.50	29.50	21.25	27.00
**410	18.50	21.50	26.50	17.60	22.00
416	19.00	22.00	27.00	18.25	23.50
††420	24.00	28.50	33.50	23.75	36.50
430	19.00	22.00	29.00	17.50	22.50
‡‡430F	19.50	22.50	29.50	18.75	24.50
440A	24.00	28.50	33.50	23.75	36.50
442	22.50	25.50	32.50	24.00	32.00
443	22.50	25.50	32.50	24.00	32.00
446	27.50	30.50	36.50	35.00	52.00
501	8.00	12.00	15.75	12.00	17.00
502	9.00	13.00	16.75	13.00	18.00
STAINLESS CLAD STEEL (20%)					
304	.....	§§18.00	19.00	.....	.....

*With 2-3% moly. §With titanium. ‡With columbium. **Plus machining agent. ‡‡High carbon. ††Free machining. §§Includes annealing and pickling.

Rivets, Washers

Birmingham

F.o.b. Pittsburgh, Cleveland, Chicago

Structural	3.75c
⅞-inch and under	65.-5 off

Wrought, Washers, Pittsburgh, Chicago, Philadelphia, to jobbers and large nut, bolt manufacturers l.c.l. ..$2.75.-3.00 off

Bolts, Nuts

F.o.b. Pittsburgh, Cleveland, Birmingham, Chicago. Discounts for carloads additional 5%, full containers, add 10%

Carriage and Machine

½ x 6 and smaller	65½ off
Do., ⅞ and ⅝ x 6-in. and shorter	63½ off
Do., ¾ to 1 x 6-in. and shorter	61 off
1⅛ and larger, all lengths	59 off
All diameters, over 6-in. long	59 off
Tire bolts	50 off
Step bolts	56 off
Plow bolts	65 off

Stove Bolts

In packages with nuts separate 71-10 off; bulk 80 off on 15,000 of 3-inch and shorter, or 5000 over 3-in.

Nuts

Semifinished hex	U.S.S.	S.A.E.
⅞-inch and less	62	64
½-1-inch	59	60
1⅛-1½-inch	57	58
1⅝ and larger	56	..

Hexagon Cap Screws

Upset 1-in., smaller	64 off
Milled 1-in., smaller	60 off

Square Head Set Screws

Upset, 1-in., smaller	71 off
Headless, ¼-in., larger	60 off
No. 10 smaller	70 off

Metallurgical Coke

Price Per Net Ton

Beehive Ovens

Connellsville, furnace	*7.50
Connellsville, foundry	8.00- 8.50
New River, foundry	9.00- 9.25
Wise county, foundry	7.75- 8.25
Wise county, furnace	7.25- 7.75

By-Product Foundry

Kearney, N. J., ovens	13.05
Chicago, outside delivered	13.00
Chicago, delivered	13.75
Terre Haute, delivered	13.50
Milwaukee, ovens	13.75
New England, delivered	14.65
St. Louis, delivered	†18.75
Birmingham, delivered	10.90
Indianapolis, delivered	13.50
Cincinnati, delivered	13.25
Cleveland, delivered	13.20
Buffalo, delivered	13.40
Detroit, delivered	13.75
Philadelphia, delivered	13.28

*Operators of hand-drawn ovens using trucked coal may charge $8.00; effective May 26, 1945.

†14.25 from other than Ala., Mo., Tenn.

Coke By-Products

Spot, gal., freight allowed east of Omaha

Pure and 90% benzol	15.00c
Toluol, two degree	28.00c
Solvent naphtha	27.00c
Industrial xylol	27.00c

Per lb. f.o.b. works

Phenol (car lots, returnable drums)	12.50c
Do., less than car lots	13.23c
Do., tank cars	11.50c

Eastern Plants, per lb.

Naphthalene flakes, balls, bbls., to jobbers	8.00c

Per ton, bulk, f.o.b. port

Sulphate of ammonia	$20.00

Basing Point Prices are (1) those announced by U. S. Steel Corp. subsidiaries for first quarter of 1941 or in effect April 16, 1941 at designated basing points or (2) those prices announced or customarily quoted by other producers at the same designated points. Base prices under (2) cannot exceed those under (1) except to the extent prevailing in third quarter of 1940.

Extra mean additions or deductions from base prices in effect April 16, 1941.

Delivered prices applying to Detroit, Eastern Michigan, Gulf and Pacific Coast points are deemed basing points except in the case of the latter two areas when water transportation is not available, in which case nearest basing point price plus all-rail freight may be charged.

Domestic Ceiling prices are the aggregate of (1) governing basing point price, (2) extras and (3) transportation charges to the point of delivery as customarily computed. **Governing basing point** is basing point nearest the consumer providing the lowest delivered price.

Seconds, maximum prices: flat-rolled rejects 85% of prime prices, wasters 75%, waste-wasters 65% except plates, which take waster prices; tin plate $2.80 per 100 lbs: terne plate $2.25; semifinished 85% of primes; other grades limited to new material ceilings.

Export ceiling prices may be either the aggregate of (1) governing basing point or emergency basing point (2) export extras (3) export transportation charges provided they are the f.a.s. seaboard quotations of the U. S. Steel Export Co. on April 16, 1941.

WAREHOUSE STEEL PRICES

Base delivered price, cents per pound, for delivery within switching limits, subject to established extras.

	Hot rolled bars	Structural shapes	Plates	Floor plates	Hot rolled sheets (10 gage base)	Hot rolled bands (12 gage and heavier)	Hot rolled hoops (14 gage and lighter)	Galvanized flat sheets (24 gage base)	Cold-rolled sheets (17 gage base)	Cold finished bars	Cold-rolled strip	NE hot bars 8600 series	NE hot bars 9400 series
Boston	4.044[1]	3.912[1]	3.912[1]	5.727[1]	3.774[1]	4.106[1]	5.106[1]	5.224[14]	4.744[14]	4.244[21]	4.715	6.012[23]	6.012[23]
New York	3.853[1]	3.758[1]	3.768[1]	5.574[1]	3.590[1]	3.974[1]	3.974[1]	5.010[13]	4.613[14]	4.203[21]	4.774	.....	.....
Jersey City	3.853[1]	3.747[1]	3.768[1]	5.574[1]	3.590[1]	3.974[1]	3.974[1]	5.010[13]	4.613[14]	4.203[21]	4.774	.....	.....
Philadelphia	3.822[1]	3.666[1]	3.605[1]	5.272[1]	3.518[1]	3.922[1]	4.272[1]	5.018[13]	4.872[25]	4.172[21]	4.772	5.816[23]	5.860[23]
Baltimore	3.802[1]	3.750[1]	3.594[1]	5.252[1]	3.594[1]	3.902[1]	4.252[1]	4.894[1]	4.852[25]	4.152[21]	.....	.....	.....
Washington	3.941[2]	3.930[1]	3.796[1]	5.341[1]	3.596[1]	4.041[1]	4.391[1]	5.196[17]	4.841[30]	4.141[21]	.....	.....	.....
Norfolk, Va.	4.065[1]	4.002[1]	3.971[1]	5.465[1]	3.771[1]	4.165[1]	4.515[1]	5.371[17]	4.965[14]	4.265[21]	.....	.....	.....
Bethlehem, Pa.*	.....	3.45[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Claymont, Del.*	.....	.....	3.45[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Coatesville, Pa.*	.....	.....	3.45[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Buffalo (city)	3.85[1]	3.40[1]	3.63[1]	5.26[1]	3.35[1]	3.819[1]	3.819[1]	4.75[15]	4.40[30]	3.85[21]	4.669	5.60[23]	5.75[23]
Buffalo (country)	3.25[1]	3.30[1]	3.30[1]	4.90[1]	3.25[1]	3.81[1]	3.50[1]	4.65[15]	4.30[30]	3.75[21]	4.35	5.60[23]	5.75[23]
Pittsburgh (city)	3.35[1]	3.40[1]	3.40[1]	5.00[1]	3.35[1]	3.60[1]	3.60[1]	4.75[15]	4.40[34]	3.85[21]	.....	.....	.....
Pittsburgh (country)	3.25[1]	3.30[1]	3.30[1]	4.90[1]	3.25[1]	3.50[1]	3.50[1]	4.65[15]	4.30[34]	3.75[21]	.....	.....	.....
Cleveland (city)	3.35[1]	3.588[1]	3.40[1]	5.188[1]	3.35[1]	3.60[1]	3.60[1]	4.877[13]	4.40[34]	3.85[21]	4.45[21]	5.60[23]	5.65[23]
Cleveland (country)	3.25[1]	.....	3.30[1]	.....	3.25[1]	3.50[1]	3.50[1]	.....	4.30[34]	3.75[21]	4.35[21]	.....	.....
Detroit	3.450[1]	3.661[1]	3.609[1]	5.281[1]	3.450[1]	3.700[1]	3.700[1]	5.000[13]	4.500[34]	3.900[21]	4.659	5.93[23]	5.93[23]
Omaha (city, delivered)	4.043[1]	4.093[1]	4.093[1]	5.693[1]	3.793[1]	4.143[1]	4.143[1]	5.615[13]	5.443[34]	4.543[13]	.....	.....	.....
Omaha (country, base)	3.943[1]	3.993[1]	3.993[1]	5.593[1]	3.693[1]	4.043[1]	4.043[1]	5.515[13]	.....	.....	.....	.....	.....
Cincinnati	3.611[2]	3.691[1]	3.661[1]	5.291[1]	3.425[1]	3.675[1]	3.675[1]	4.825[13]	4.475[34]	4.111[21]	4.711	6.10	6.30
Youngstown, O.*	.....	.....	.....	.....	.....	.....	.....	4.40[13]	.....	.....	.....	.....	.....
Middletown, O.*	.....	.....	.....	.....	3.25[1]	3.50[1]	3.50[1]	4.65[15]	.....	.....	.....	.....	.....
Chicago (city)	3.50[1]	3.55[1]	3.55[1]	5.15[1]	3.25[1]	3.60[1]	3.60[1]	5.231[13]	4.20[34]	3.85[21]	4.65	5.75[23]	5.85[23]
Milwaukee	3.637[1]	3.687[1]	3.687[1]	5.287[1]	3.587[1]	3.737[1]	3.737[1]	5.272[13]	4.337[34]	3.987[21]	4.787	5.987[23]	6.087[23]
Indianapolis	3.58[1]	3.63[1]	3.63[1]	5.23[1]	3.518[1]	3.768[1]	3.768[1]	4.918[13]	4.568[34]	4.08[21]	4.78	6.08[23]	6.18[23]
St. Paul	3.76[29]	3.81[1]	3.81[1]	5.41[1]	3.51[1]	3.86[1]	3.86[1]	5.257[13]	4.46[34]	4.461[21]	5.103	6.09[23]	6.19[23]
St. Louis	3.647[1]	3.697[1]	3.697[1]	5.297[1]	3.397[1]	3.747[1]	3.747[13]	5.172[13]	4.347[34]	4.131[21]	4.931	6.131[23]	6.231[23]
Memphis, Tenn.	4.015[5]	4.065[5]	4.065[5]	5.78[5]	3.965[5]	4.215[5]	4.215[5]	5.265[13]	4.78[34]	4.43[21]	.....	.....	.....
Birmingham	3.50[1]	3.55[1]	3.55[1]	5.903[1]	3.45[1]	3.70[1]	3.70[1]	4.75[13]	4.852[34]	4.64	5.215	.....	.....
New Orleans (city)	4.10[4]	3.90[4]	3.90[4]	5.85[4]	4.058[4]	4.20[4]	4.20[4]	5.25[13]	5.079[13]	4.70[21]	5.439	.....	.....
Houston, Tex.	3.75[3]	4.25[1]	4.25[1]	5.50[3]	3.763[3]	4.313[3]	4.313[3]	5.313[13]	5.594[13]	3.75[21]	.....	.....	.....
Los Angeles	4.40[4]	4.65[4]	4.95[4]	7.20[4]	5.00[4]	4.95[4]	6.75[4]	6.00[13]	7.20[4]	5.683[21]	5.613	5.85[23]	5.95[23]
San Francisco	4.15[7]	4.35[7]	4.65[7]	6.35[7]	4.55[7]	4.50[7]	5.75[7]	6.35[13]	7.30[13]	5.433[21]	7.333	8.304[23]	8.404[23]
Portland, Oreg.	4.45[27]	4.45[27]	4.75[27]	6.50[27]	4.65[27]	4.75[27]	6.30[27]	5.75[13]	6.60[13]	5.633[13]	.....	.....	.....
Tacoma	4.55[3]	4.45[3]	4.75[3]	6.50[3]	4.65[3]	4.25[3]	5.45[3]	5.95[13]	7.60[13]	5.883[21]	.....	.....	8.00[23]
Seattle	4.35[3]	4.45[3]	4.75[3]	6.50[3]	4.65[3]	4.25[3]	5.45[3]	5.95[13]	7.05[13]	5.883[21]	.....	.....	8.00[23]

*Basing point cities with quotations representing mill prices, plus warehouse spread.
NOTE—All prices fixed by Office of Price Administration in Amendments Nos. 10 to 33 to Revised Price Schedule No. 49. Deliveries outside above cities computed in accordance with regulations.

BASE QUANTITIES

[1]—400 to 1999 pounds; [2]—400 to 14,999 pounds; [3]—any quantity; [4]—800 to 1999 pounds; [5]—400 to 8999 pounds; [6]—300 to 9999 pounds; [7]—400 to 39,999 pounds; [8]—under 2000 pounds; [9]—under 4000 pounds; [10]—500 to 1499 pounds; [11]—one bundle to 39,999 pounds; [12]—150 to 2249 pounds; [13]—150 to 1499 pounds; [14]—three to 24 bundles; [15]—450 to 1499 pounds; [16]—one bundle to 1499 pounds; [17]—one to nine bundles; [18]—one to six bundles; [19]—100 to 749 pounds; [20]—300 to 1999 pounds; [21]—1500 to 39,999 pounds; [22]—1500 to 1999 pounds; [23]—1000 to 39,999 pounds; [24]—400 to 1499 pounds; [25]—1000 to 1999 pounds; [26]—under 25 bundles. Cold-rolled strip, 2000 to 39,999 pounds, base; [27]—300 to 4999 pounds.

Ores

Lake Superior Iron Ore

Gross ton, 51½% (Natural) Lower Lake Ports

Old range bessemer	$4.95
Mesabi nonbessemer	4.55
High phosphorus	4.55
Mesabi bessemer	4.70
Old range nonbessemer	4.80

Eastern Local Ore

Cents, units, del. E. Pa.

Foundry and basic 50-63% contract	13.00

Foreign Ore

Cents per unit, c.i.f. Atlantic ports

Manganiferous ore, 45-55% Fe., 6-10% Mang.	Nom.
N. African low phos.	Nom.
Spanish, No. African basic, 50 to 60%	Nom.
Brazil iron ore, 68-69% f.o.b. Rio de Janeiro	7.50-8.00

Tungsten Ore

Chinese Wolframite, per short ton unit, duty paid	$24.00

Chrome Ore

(Equivalent OPA schedules):

Gross ton f.o.b. cars, New York, Philadelphia, Baltimore, Charleston, S. C., Portland, Ore., or Tacoma, Wash. ($ $ paying for discharge; dry basis, subject to penalties if guarantees are not met.)

Indian and African

48% 2.8:1	$41.00
48% 3:1	46.50
48% no ratio	51.00

South African (Transvaal)

44% no ratio	$27.40
45% no ratio	28.30
48% no ratio	31.00
50% no ratio	32.80

Brazilian—nominal

44% 2.5:1 lump	33.65
48% 3:1 lump	48.50

Rhodesian

45% no ratio	28.30
48% no ratio	31.00
48% 3:1 lump	43.50

Domestic (seller's nearest rail)

48% 3:1	52.80
less $7 freight allowance	

Manganese Ore

Sales prices of Metals Reserve Co., cents per gross ton unit, dry, 48%, at New York, Philadelphia, Baltimore, Norfolk, Mobile and New Orleans, 85.0c; Fontana, Calif., Provo, Utah, and Pueblo, Colo., 91.0c; prices include duty on imported ore and are subject to premiums, penalties and other provisions of amended M.P.R. No. 248, effective as of May 15. Price at basing points which are also points of discharge of imported manganese ore is f.o.b. cars, shipside, at dock most favorable to the buyer.

Molybdenum

Sulphide conc., lb., Mo. cont., mines	$0.75

NATIONAL EMERGENCY STEELS (Hot Rolled)

(Extras for alloy content)

Designation	Chemical Composition Limits, Per Cent — C	Mn.	Si.	Cr.	Ni.	Mo.	Basic open-hearth Electric furnace: Bars per 100 lb.	Billets per GT	Bars per 100 lb.	Billets per GT
NE 8612	.10-.15	.70-.90	.20-.35	.40-.60	.40-.70	.15-.25	$0.65	$13.00	$1.15	$23.00
NE 8720	.18-.23	.70-.90	.20-.35	.40-.60	.40-.70	.20-.30	.70	14.00	1.20	24.00
NE 9415	.13-.18	.80-1.10	.20-.35	.30-.50	.30-.60	.08-.15	.75	15.00	1.25	25.00
NE 9425	.23-.28	.80-1.20	.20-.35	.30-.50	.30-.60	.08-.15	.75	15.00	1.25	25.00
NE 9442	.40-.45	1.00-1.30	.20-.35	.30-.50	.30-.60	.08-.15	.80	16.00	1.30	26.00
NE 9722	.20-.25	.50-.80	.20-.35	.10-.25	.40-.70	.15-.25	.65	13.00	1.15	23.00
NE 9830	.28-.33	.70-.90	.20-.35	.70-.90	.85-1.15	.20-.30	1.30	26.00	1.80	36.00
NE 9912	.10-.15	.50-.70	.20-.35	.40-.60	1.00-1.30	.20-.30	1.20	24.00	1.55	31.00
NE 9920	.18-.23	.50-.70	.20-.35	.40-.60	1.00-1.30	.20-.30	1.20	24.00	1.55	31.00

Extras are in addition to a base price of 2.70c, per pound on finished products and $54 per gross ton on semifinished steel major basing points and are in cents per pound and dollars per gross ton. No prices quoted on vanadium alloy.

Pig Iron

Prices (in gross tons) are maximum fixed by OPA Price Schedule No. 10, effective June 10, 1941, amended Feb. 14, and Oct. 22, 1945. Exceptions indicated in footnotes. Base prices bold face, delivered light face. Federal tax on freight charges, effective Dec. 1, 1942, not included.

	Foundry	Basic	Bessemer	Malleable
Bethlehem, Pa., base	$26.75	$26.25	$27.75	$27.25
Newark, N. J., del.	28.28	27.78	29.28	28.78
Brooklyn, N. Y., del.	29.25	.....	.....	29.75
Birdsboro, Pa., base	26.75	26.25	27.75	27.25
Birmingham, base	22.13	20.75	26.75	.....
Baltimore, del.	27.36	.....	.....	.....
Boston, del.	26.89	.....	.....	.....
Chicago, del.	25.97	.....	.....	.....
Cincinnati, del.	25.81	24.48	.....	.....
Cleveland, del.	25.87	24.99	.....	.....
Newark, N. J.	27.90	.....	.....	.....
Philadelphia, del.	27.21	26.71	.....	.....
St. Louis, del.	25.87	24.99	.....	.....
Buffalo, base	25.75	24.75	26.75	26.25
Boston, del.	27.25	26.75	28.25	27.75
Rochester, del.	27.28	.....	28.28	27.78
Syracuse, del.	27.83	.....	28.83	28.33
Chicago, base	25.75	25.25	26.25	25.75
Milwaukee, del.	26.85	26.35	27.35	26.85
Muskegon, Mich., del.	28.94	.....	.....	28.94
Cleveland, base	25.75	25.25	26.25	25.75
Akron, Canton, del.	27.14	26.64	27.64	27.14
Detroit, base	25.75	25.25	26.25	25.75
Saginaw, Mich., del.	28.06	27.56	28.56	28.06
Duluth, base	26.25	25.75	26.75	26.25
St. Paul, del.	28.38	27.88	28.88	28.38
Erie, Pa., base	25.75	25.25	26.75	26.25
Everett, Mass., base	26.75	26.25	27.75	27.25
Boston, del.	27.25	26.75	28.25	27.75
Granite City, Ill., base	25.75	25.25	26.25	25.75
St. Louis, del.	26.25	25.75	.....	26.25
Hamilton, O., base	25.75	25.25	.....	25.75
Cincinnati, del.	26.19	26.36	.....	26.86
Neville Island, Pa., base	25.75	25.25	26.25	25.75
§Pittsburgh, del. No. & So. sides	26.44	25.94	26.94	26.44
Provo, Utah, base	23.75	23.25	.....	.....
Sharpsville, Pa., base	25.75	25.25	26.25	25.75
Sparrows Point, base	26.75	26.25	.....	.....
Baltimore, del.	27.74	.....	.....	.....
Steelton, Pa., base	.....	26.25	.....	27.25
Swedeland, Pa., base	26.75	26.25	27.75	27.25
Philadelphia, del.	27.59	27.09	.....	28.09
Toledo, O., base	25.75	25.25	26.25	25.75
Youngstown, O., base	25.75	25.25	26.25	25.75
Mansfield, O., del.	27.69	27.19	28.19	27.69

Base grade, silicon 1.75-2.25%; add 50 cents for each additional 0.25% silicon, or portion thereof; deduct 50 cents for silicon below 1.75% on foundry iron. §For McKees Rocks, Pa., add .55 to Neville Island base; Lawrenceville, Homestead, McKeesport, Ambridge, Monaco, Aliquippa, .84; Monessen, Monongahela City .97 (water); Oakmont, Verona 1.11; Brackenbridge 1.24

Note: Add 50 cents per ton for each 0.50% manganese or portion thereof over 1.00%.

Nickel differentials: Under 0.50%, no extra; 0.50% to 0.74% incl., $2 per ton; for each additional 0.25% nickel, $1 per ton.

High Silicon, Silvery

6.00-6.50 per cent (base)	$31.25		
6.51-7.00	$32.25	9.01- 9.50	37.25
7.01-7.50	33.25	9.51-10.00	38.25
7.51-8.00	34.25	10.01-10.50	39.25
8.01-8.50	35.25	10.51-11.00	40.25
8.51-9.00	36.25	11.01-11.50	41.25

F.o.b. Jackson county, O., per gross ton. Buffalo base $1.25 higher, whichever is most favorable to buyer. Prices subject to additional charge of 50 cents a ton for each 0.50% manganese in excess of 1.00%.

Electric Furnace Ferrosilicon: Sil. 14.01 to 14.50%, $45.50 Jackson Co.; each additional .50% silicon up to and including 18% add $1; low impurities not exceeding 0.005 Phos., 0.40 Sulphur, 1.0% Carbon, add $1.

Bessemer Ferrosilicon

Prices same as for high silicon silvery iron, plus $1 per gross ton.

Charcoal Pig Iron

Northern

Lake Superior Furn. $34.00
Chicago, del. 37.34

Southern

Semi-cold blast, low phos., f.o.b. furnace, Lyles, Tenn. $33.00 (For higher silicon irons a differential over and above the price of base grade is charged as well as for the hard chilling iron, Nos. 5 and 6.)

Gray Forge

Neville Island, Pa. $25.25
Valley base 25.25

Low Phosphorus

Basing points: Birdsboro, Pa., Steelton, Pa., and Buffalo, N. Y., $31.25 base; $32.49, del. Philadelphia. Intermediate phos., Central Furnace, Cleveland, $28.25.

Switching Charges: Basing Point prices are subject to an additional charge for delivery within the switching limits of the respective districts.

Silicon Differential: Basing point prices are subject to an additional charge not to exceed 50 cents a ton for each 0.25 silicon in excess of base grade (1.75 to 2.25%).

Phosphorus Differential: Basing point prices are subject to a reduction of 38 cents a ton for phosphorus content of 0.70% and over.

Ceiling Prices are the aggregate of (1) governing basing point (2) differentials (3) transportation charges from governing basing point to point of delivery as customarily computed. Governing basing point is the one resulting in the lowest delivered price for the consumer.

Exceptions to Ceiling Prices: Struthers Iron & Steel Co. may charge 50 cents a ton in excess of basing point prices for No. 2 Foundry, Basic, Bessemer and Malleable. Mystic Iron Works, Everett, Mass., may exceed basing point prices by $1 per ton.

Refractories

Per 1000 f.o.b. Works, Net Prices

Fire Clay Brick

Super Duty

Pa., Mo., Ky. $68.50

First Quality

Pa., Ill., Md., Mo., Ky.	54.40
Alabama, Georgia	54.40
New Jersey	50.35
Ohio	47.70

Second Quality

Pa., Ill., Md., Mo., Ky.	49.35
Alabama, Georgia	40.30
New Jersey	52.00
Ohio	38.15

Malleable Bung Brick

All bases 63.45

Silica Brick

Pennsylvania	54.40
Joliet, E. Chicago	62.45
Birmingham, Ala.	54.40

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry Press	32.90
Wire Cut	30.80

Magnesite

Domestic dead-burned grains, net ton f.o.b. Chewelah, Wash., net ton, bulk	22.00
net ton, bags	26.00

Basic Brick

net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick	54.00
Chem. bonded chrome	54.00
Magnesite brick	76.00
Chem. bonded Magnesite	65.00

Fluorspar

Metallurgical grade, f.o.b. Ill., Ky., net tons, carloads, CaF_2 content, 70% or more, $33; 65 but less than 70%, $32; 60 but less than 65% $31; less than 60%, $30. After Aug. 29 base price any grade $30.00 war chemicals.

Ferroalloy Prices

Ferromanganese (standard) 78-82% c.l. gross ton, duty paid, $135 f.o.b. cars, Baltimore, Philadelphia or New York, whichever is most favorable to buyer; Rockdale or Rockwood, Tenn.; where Tennessee Products Co. is producer; Birmingham, Ala., where Sloss-Sheffield Steel & Iron Co. is producer; $140 f.o.b. cars, Pittsburgh, where Carnegie-Illinois Steel Corp. is producer; add $6 for packed c.l., $10 for ton, $13.50 for less ton; $1.70 for each 1%, or fraction contained manganese over 82% or under 78%.

Ferromanganese (Low and Medium Carbon); per lb. contained manganese; eastern zone, low carbon, bulk, c.l., 23c; 2000 lb. to c.l., 23.40c; medium, 14.50c and 15.20c; central, low carbon, bulk, c.l., 23.30c; 2000 lb. to c.l., 24.40c; medium 14.80c and 16.20c; western, low carbon, bulk, c.l., 24.50c, 2000 lb. to c.l., 25.40c; medium, 15.75c and 17.20c; f.o.b. shipping point, freight allowed.

Spiegeleisen: 19-21% carlots per gross ton, Palmerton, Pa., $36; Pittsburgh, $40.50; Chicago, $40.60.

Electrolytic Manganese: 99.9% plus, less ton lots, per lb. 37.6 cents.

Chromium Metal: 97% min. chromium, max. .50% carbon, eastern zone, per lb. contained chromium bulk, c.l., 79.50c, 2000 lb. to c.l. 80c; central 81c and 82.50c; western 82.25c and 84.75c; f.o.b. shipping point, freight allowed.

Ferrocolumbium: 50-60%, per lb. contained columbium in gross ton lots, contract basis, R. R. freight allowed, eastern zone, $2.25; less-ton lots $2.30. Spot prices 10 cents per lb. higher.

Ferrochrome: High carbon, eastern zone, bulk, c.l., 13c, 2000 lb. to c.l. 13.90c; central, add .40c and .65c; western, add 1c and 1.85c—high nitrogen, high carbon ferrochrome; Add 5c to all high carbon ferrochrome prices; all zones; low carbon eastern, bulk, c.l. max. 0.06% carbon, 23c, 0.10% 22.50c, 0.15% 22c, 0.20% 21.50c, 0.50% 21c, 1.00% 20.50c, 2.00% 19.50c; 2000 lb. to c.l., 0.06% 24c, 0.10% 23.50c, 0.15% 23c, 0.20% 22.50c, 0.50% 22c, 1.00% 21.50c, 2.00% 20.50c; central, add .4c for bulk, c.l. and .65 for 2000 lb. to c.l.; western, add 1c for bulk, c.l. and 1.85c for 2000 lb. c.l.; carload packed differential .45c; f.o.b. shipping point, freight allowed. Prices per lb. contained Cr high nitrogen, low carbon ferrochrome: Add 2c to low carbon ferrochrome prices; all zones. For higher nitrogen carbon add 2c for each .25% of nitrogen over 0.75%.

Special Foundry ferrochrome: (Chrom. 62-66%, car. approx. 5-7%) Contract, carload, bulk 13.50c, packed 13.95c, ton lots 14.40c, less, 14.90c, eastern, freight allowed, per pound contained chromium; 13.90c, 14.35c, 15.05c and 15.55c central; 14.50c, 14.95c, 16.25c and 16.75c, western; spot up .25c.

S.M. Ferrochrome, high carbon: (Chrom: 60-65%, sil. 4-6%, mang. 4-6% and carbon 4-6%.) Contract, carlot, bulk, 14.00c, packed 14.45c, ton lots 14.90c, less 15.40c, eastern, freight allowed; 14.40c, 14.85c, 15.55c and 16.05c, central; 15.00c, 15.45c, 16.75c and 17.25c, western; spot up .25c; per pound contained chromium.

S.M. Ferrochrome, low carbon: (Chrom. 62-66%, sil. 4-6%, mang. 4-6% and carbon 1.25% max.) Contract, carlot, bulk, 20.00c, packed 20.45c, ton lots 21.00c, less ton lots 22.00c, eastern, freight allowed, per pound contained chromium, 20.40c, 20.85c, 21.65c and 22.65c, central; 21.00c, 21.45c, 22.85c and 23.85c, western; spot up .25c.

SMZ Alloy: (Silicon 60-65%, Mang. 5-7%, zir. 5-7% and iron approx. 20%) per lb. of alloy contract carlots 11.50c, ton lots 12.00c, less 12.50c, eastern zone, freight allowed; 12.00c, 12.85c and 13.35c central zone; 14.05c, 14.60c and 15.10c, western; spot up .25c.

Silcas Alloy: (Sil. 35-40%, cal. 9-11%, alum. 6-8%, zir. 3-5%, tit. 9-11% and boron 0.55-0.75%), per lb. of alloy contract, carlots 25.00c, ton lots 26.00c, less ton lots 27.00c, eastern, freight allowed, 25.50c, 26.75c and 27.75c, central; 27.50c, 28.90c and 29.90c, western; spot up .25c.

Silvas Alloy: (Sil. 35-40%, van. 9-11%, alum. 5-7%, zir. 5-7%, tit. 9-11% and boron 0.55-0.75%), per lb. of alloy. Contract, carlots 58.00c, ton lots 59.00c, less 60.00c, eastern, freight allowed; 58.50c, 59.75c and 60.75c, central; 60.50c, 61.90c and 62.90c, western; spot up ¼c.

CMSZ Alloy 4: (Chr. 45-49%, mang. 4-6%, sil. 18-21%, zir. 1.25-1.75%, and car. 3.00-4.50%). Contract carlots, bulk, 11.00c and packed 11.50c; ton lots 12.00c; less 12.50c, eastern, freight allowed; 11.50c and 12.00c, 12.75c, 13.25c, central; 13.50c and 14.00c, 14.75c, 15.25c, western; spot up .25c.

CMSZ Alloy 5: (Chr. 50-56%, mang. 4-6%, sil. 13.50-16.00%, zir. .75-1.25%, car. 3.50-5.00%) per lb. of alloy. Contract, carlots, bulk, 10.75c, packed 11.25c, ton lots 11.75c, less 12.25c, eastern, freight allowed; 11.25c, 11.75c and 12.50c, central; 13.25c and 13.75c, 14.50c and 15.00c, western; spot up .25c.

Ferro-Boron: (Bor. 17.50% min., sil. 1.50% max., alum. 0.50% max. and car. 0.50% max.) per lb. of alloy contract ton lots, $1.20, less ton lots $1.30, eastern, freight allowed; $1.2075 and $1.3075 central; $1.229 and $1.329, western; spot add 5c.

Manganese-Boron: (Mang. 75% approx., boron 15-20%, iron 5% max. sil. 1.50% max. and carbon 3% max.), per lb. of alloy. Contract ton lots, $1.89, less $2.01, eastern; freight allowed; $1.903 and $2.023, central, $1.935 and $2.055 western; spot up 5c.

Nickel-Boron: (Bor. 15-18%, alum. 1% max., sil. 1.50% max., car. 0.50% max., iron 3% max., nickel, balance), per lb. of alloy. Contract, 5 tons or more, $1.90, 1 ton to 5 tons, $2.00, less than ton $2.10, eastern, freight allowed; $1.9125, $2.0125 and $2.1125, central; $1.9445, $2.0445 and $2.1445, western; spot same as contract.

Chromium-Copper: (Chrom. 8-11%, cu. 88-90%, iron 1% max. sil. 0.50% max.) contract, any quantity, 45c, eastern, Niagara Falls, N. Y., basis, freight allowed to destination, except to points taking rate in excess of St. Louis rate to which equivalent of St. Louis rate will be allowed; spot up 2c.

Vanadium Oxide: (Fused: Vanadium oxide 85-88%, sodium oxide approx. 10% and calcium oxide, approx. 2%, or Red Cake; Vanadium oxide 85% approx., sodium oxide, approx. 9% and water approx.

2.5%) Contract, any quantity, $1.10 eastern, freight allowed per pound vanadium oxide contained; contract carlots, $1.105, less carlots, $1.108, central; $1.118 and $1.133, western; spot add 5c to contracts in all cases.

Calcium metal; cast: Contract ton lots or more $1.35, less, $1.60, pound of metal; $1.36 and $1.61 central, $1.40 and $1.65, western; spot up 5c.

Calcium-Manganese-Silicon: (Cal. 16-20% mang. 14-18% and sil. 53-59%), per lb. of alloy. Contract, carlots, 15.50c, ton lots 16.50c and less 17.00c, eastern, freight allowed; 16.00c, 17.35c, and 17.85c, central; 18.05c, 19.10c and 19.60c western; spot up .25c.

Calcium-Silicon: (Cal, 30-35%, sil. 60-65% and iron 3.00% max.), per lb. of alloy. Contract, carlot, lump 18.00c, ton lots 14.50c, less 15.50c, eastern, freight allowed; 13.50c, 15.25c and 16.25c central; 15.55c, 17.40c and 18.40c, western; spot up .25c.

Briquets, Ferromanganese: (Weight approx. 3 lbs. and containing exactly 2 lbs. mang.) per lb. of briquets. Contract, carlots, bulk .0605c, packed .063c, tons .0655c, less .068c eastern freight allowed; .063c, .0655c, .0755c and .078c, central; .068c, .0685c, .0855c, and .088c, western; spot up .25c.

Briquets: Ferrochrome, containing exactly 2 lb. cr., eastern zone, bulk, c.l., 8.25c per lb. of briquets, 2000 lb. to c.l., 8.75c; central, add .3c for c.l. and .5c for 2000 lb. to c.l.; western, add .70c for c.l., and .2c for 2000 lb. to c.l.; **silicomanganese,** eastern, containing exactly 2 lb. manganese and approx. ½ lb. silicon, bulk, c.l., 5.80c, 2000 lbs. to c.l., 6.30c; central, add .25c for c.l. and 1c for 2000 lb. to c.l.; western, add .5c for c.l., and 2c for 2000 lb. to c.l.; **ferrosilicon,** eastern, approx. 5 lb., containing exactly 2 lb. silicon, or weighing approx. 2½ lb. and containing exactly 1 lb. of silicon, bulk, c.l., 3.35c, 2000 lb. to c.l., 3.80c; central, add 1.50c for c.l., and .40c for 2000 lb. to c.l.; western, add 3.0c for c.l. and .45c for 2000 to c.l.; f.o.b. shipping point, freight allowed.

Ferromolybdenum: 55-75% per lb. contained molybdenum f.o.b. Langeloth and Washington, Pa., furnace, any quantity 95.00c.

Ferrophosphorus: 17-19%, based on 18% phosphorus content, with unitage of $3 for each 1% of phosphorus above or below the base; gross tons per carload f.o.b. sellers' works, with freight equalized with Rockdale, Tenn.; contract price $58.50, spot $62.25.

Ferrosilicon: Eastern zone, 90-95%, bulk, c.l., 11.05c, 2000 lb. to c.l., 12.30c; 80-90%, bulk c.l., 8.90c, 2000 lb. to c.l., 9.95c; 75%, bulk, c.l., 8.05c, 2000 lb. to c.l., 9.05c; 50%, bulk c.l., 6.65c and 2000 lb. to c.l., 7.85c; central 90-95%, bulk, c.l., 11.20c, 2000 lb. to c.l., 12.80c; 80-90%, bulk, c.l., 9.05c, 2000 to c.l., 10.45c; 75%, bulk, c.l., 8.20c, 2000 lb. to c.l., 9.65c; 50% bulk, c.l., 7.10c, 2000 lb. to c.l., 9.70c; western, 90-95%, bulk, c.l., 11.65c, 2000 lb. to c.l., 15.60c; 80-90%, bulk, c.l., 9.55c, 2000 lb. to c.l., 13.50c; 75%, bulk, c.l., 8.75c, 2000 to c.l., 13.10c; 50%, bulk, c.l., 7.25c, 2000 to c.l., 8.75c; f.o.b. shipping point, freight allowed. Prices per lb. contained silicon.

Grainal: Vanadium Grainal No. 1 87.5c; No. 6, 60c; No. 79, 45c; all f.o.b. Bridgeville, Pa., usual freight allowance.

Silicon Metal: Min. 97% silicon and max. 1% iron, eastern zone, bulk, c.l., 12.90c; 2000 lb. to c.l., 13.45c; central, 13.20c and 13.90c; western, 13.85c and 16.80c; min. 96% silicon and max. 2% iron, eastern, bulk, c.l., 12.50c, 2000 lb. to c.l., 13.10c; central, 12.80c and 13.55c; western, 13.45c and 16.50c f.o.b. shipping point, freight allowed. Price per lb. contained silicon.

Manganese Metal: (96% min. manganese, max. 2% iron), per lb. of metal, eastern zone, bulk, c.l., 30c, 2000 lb. to c.l., 32c, central, 30.25c, and 33c; western 30.55c and 35.05c.

Ferrotungsten: Spot, 10,000 lb. or more, per lb. contained tungsten, $1.90; contract, $1.88; freight allowed as far west as St. Louis.

Tungsten Metal Powder: Spot, not less than 97 per cent, $2.50-$2.60; freight allowed as far west as St. Louis.

Ferrotitanium: 40-45%, R.R. freight allowed, per lb. contained titanium; ton lots $1.23; less-ton lots $1.25; eastern. Spot up 5 cents per lb.

Ferrotitanium: 20-25%, 0.10 maximum carbon; per lb. contained titanium; ton lots $1.35; less-ton lots $1.40 eastern. Spot 5 cents per lb. higher.

High-Carbon Ferrotitanium: 15-20% contract basis, per net ton, f.o.b. Niagara Falls, N. Y., freight allowed to destination east of Mississippi River and North of Baltimore and St. Louis, 6.8% carbon $142.50; 3-5% carbon $157.50.

Carbortam: Boron 0.90 to 1.15% net ton to carload, 8c lb. f.o.b. Suspension Bridge, N. Y., frt. allowed same as high-carbon ferrotitanium.

Bortam: Boron 1.5-1.9%, ton lots 45c lb., less ton lots 50c lb.

Ferrovanadium: 35-55%, contract basis, per lb. contained vanadium, f.o.b. producers plant with usual freight allowances; open-hearth grade $2.70; special grade $2.80; highly-special grade $2.90.

Zirconium Alloys: 12-15%, per lb. of alloy, eastern contract, carlots, bulk, 4.60c, packed 4.80c, ton lots 4.80c, less tons 5c, carloads, bulk, per gross ton $102.50; packed $107.50; ton lots $108; less-ton lots $112.50. Spot ¼c per ton higher.

Zirconium Alloy: 35-40%, Eastern, contract basis, carloads in bulk or package, per lb. of alloy 14.00c; gross ton lots 15.00c; less-ton lots 16.00c. Spot ¼ cent higher.

Alsifer: (Approx. 20% aluminum, 40% silicon, 40% iron) contract basis f.o.b. Niagara Falls, N. Y., per lb. 5.75c; ton lots 6.50c. Spot ½ cent higher.

Siminal: (Approx. 20% each si., Mn., Al.) Contract, frt. all. not over St. Louis rate, per lb. alloy; carlots 8c; ton lots 8.75c; less ton lots 9.25c.

Borosil: 3 to 4% boron, 40 to 45% Si., $6.25 lb. cont. Bo., f.o.b. Plant O., freight not exceeding St. Louis rate allowed.

OPEN MARKET PRICES, IRON AND STEEL SCRAP

Following prices are quotations developed by editors of STEEL in the various centers. For complete OPA ceiling price schedule refer to page 156 of Sept. 4, 1944, issue of STEEL. Quotations are on gross tons.

PHILADELPHIA:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$18.75
No. 2 Heavy Melt. Steel	18.75
No. 2 Bundles	18.75
No. 3 Bundles	16.75
Mixed Borings, Turnings	13.75
Machine Shop Turnings	13.75
Billet, Forge Crops	23.75
Bar Crops, Plate Scrap	21.25
Cast Steel	21.25
Punchings	21.25
Elec. Furnace Bundles	19.75
Heavy Turnings	18.25

Cast Grades

(F.o.b. Shipping Point)

Heavy Breakable Cast	16.50
Charging Box Cast	19.00
Cupola Cast	20.00
Unstripped Motor Blocks	17.50
Malleable	22.00
Chemical Borings	16.51

NEW YORK:

(Dealers' buying prices)

No. 1 Heavy Melt. Steel	$15.33
No. 2 Heavy Melt. Steel	15.33
No. 2 Hyd. Bundles	15.33
No. 3 Hyd. Bundles	13.33
Chemical Borings	14.33
Machine Turnings	10.33
Mixed Borings, Turnings	10.33
No. 1 Cupola	20.00
Charging Box	19.00
Heavy Breakable	16.50
Unstrip Motor Blocks	17.50
Stove Plate	19.00

CLEVELAND:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$19.50
No. 2 Heavy Melt. Steel	19.50
No. 1 Comp. Bundles	19.50
No. 2 Comp. Bundles	19.50
No. 1 Busheling	19.50
Mach. Shop Turnings	14.50
Short Shovel Turnings	16.50
Mixed Borings, Turnings	14.50
No. 1 Cupola Cast	20.00
Heavy Breakable Cast	16.50
Cast Iron Borings	13.50-14.00
Billet, Bloom Crops	24.50
Sheet Bar Crops	22.00
Plate Scrap, Punchings	22.00
Elec. Furnace Bundles	20.50

BOSTON:

(F.o.b. shipping points)

No. 1 Heavy Melt. Steel	$14.06
No. 2 Heavy Melt. Steel	14.06
No. 1 Bundles	14.06
No. 2 Bundles	14.06
No. 1 Busheling	14.06
Machine Shop Turnings	9.06
Mixed Borings, Turnings	9.06
Short Shovel Turnings	11.06
Chemical Borings	13.31
Low Phos. Clippings	16.56
No. 1 Cast	20.00
Clean Auto Cast	20.00
Stove Plate	19.00
Heavy Breakable Cast	16.50

Boston Differential 99 cents higher, steel-making grades; Providence $1.09 higher.

PITTSBURGH:

(Delivered consumer's plant)

Railroad Heavy Melting	$21.00
No. 1 Heavy Melt. Steel	20.00
No. 2 Heavy Melt. Steel	20.00
No. 1 Comp. Bundles	20.00
No. 2 Comp. Bundles	20.00
Short Shovel Turnings	17.00
Mach. Shop Turnings	15.00
Mixed Borings, Turnings	15.00
No. 1 Cupola Cast	20.00
Heavy Breakable Cast	16.50
Cast Iron Borings	16.00
Billet, Bloom Crops	25.00
Sheet Bar Crops	22.50
Plate Scrap, Punchings	22.50
Railroad Specialties	24.50
Scrap Rail	21.50
Axles	26.00
Rail 3 ft. and under	23.50
Railroad Malleable	22.00

VALLEY:

(Delivered consumer's plant)

No. 1 R.R. Heavy Melt.	$21.00
No. 1 Heavy Melt. Steel	20.00
No. 1 Comp. Bundles	20.00
Short Shovel Turnings	17.00
Cast Iron Borings	16.00
Machine Shop Turnings	15.00
Low Phos. Plate	22.50

MANSFIELD, O:

(Delivered consumer's plant)

Machine Shop Turnings	$15.00

BIRMINGHAM:

(Delivered consumer's plant)

Billet Forge Crops	$22.00
Structural, Plate Scrap	19.00
Scrap Rails Random	18.50
Rerolling Rails	20.50
Angle Splice Bars	20.50
Solid Steel Axles	24.00
Cupola Cast	20.00
Stove Plate	19.00
Long Turnings	8.50- 9.00
Cast Iron Borings	8.50- 9.00
Iron Car Wheels	16.50-17.00

CHICAGO:

(Delivered consumer's plant)

No. 1 R.R. Heavy Melt.	$19.75
No. 1 Heavy Melt. Steel	18.75
No. 2 Heavy Melt. Steel	18.75
No. 1 Ind. Bundles	18.75
No. 2 Dlr. Bundles	18.75
Baled Mach. Shop Turn.	18.75
No. 3 Galv. Bundles	16.75
Machine Turnings	13.75
Mix. Borings, Sht. Turn.	13.75
Short Shovel Turnings	15.75
Cast Iron Borings	14.75
Scrap Rails	20.25
Cut Rails, 3 feet	22.25
Cut Rails, 18-inch	23.50
Angles, Splice Bars	22.25
Plate Scrap, Punchings	21.25
Railroad Specialties	22.75
No. 1 Cast	20.00
R.R. Malleable	22.00

(Cast grades f.o.b. shipping point, railroad grades f.o.b. tracks)

BUFFALO:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$19.25
No. 2 Heavy Melt. Steel	19.25
No. 1 Bundles	19.25
No. 2 Bundles	19.25
No. 1 Busheling	19.25
Machine Turnings	14.25
Short Shovel Turnings	16.25
Mixed Borings, Turn.	14.25
Cast Iron Borings	15.25
Low Phos.	21.75

DETROIT:

(Delivered consumer's plant)

Heavy Melting Steel	$17.32
No. 1 Busheling	17.32
Hydraulic Bundles	17.32
Flashings	17.32
Machine Turnings	12.32
Short Shovel, Turnings	14.32
Cast Iron Borings	13.32
Low Phos. Plate	19.82
No. 1 Cast	20.00
Heavy Breakable Cast	16.50

ST. LOUIS:

(Delivered consumer's plant)

Heavy Melting	17.50
No. 1 Locomotive Tires	20.00
Misc. Rails	19.00
Railroad Springs	22.00
Bundled Sheets	17.50
Axle Turnings	17.00
Machine Turnings	13.50
Shoveling Turnings	12.50
Rerolling Rails	21.00
Steel Car Axles	21.50-22.00
Steel Rails, 3 ft.	21.50
Steel Angle Bars	21.00
Cast Iron Wheels	20.00
No. 1 Machinery Cast	20.00
Railroad Malleable	22.00
Breakable Cast	13.50
Stove Plate	13.00
Grate Bars	15.25
Brake Shoes	15.25

(Cast grades f.o.b. shipping point)

Stove Plate	18.00

CINCINNATI:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$18.50
No. 2 Heavy Melt. Steel	18.50
No. 1 Comp. Bundles	18.50
No. 2 Comp. Bundles	18.50
Machine Turnings	9.50-10.00
Shoveling Turnings	11.50-12.00
Cast Iron Borings	11.00-11.50
Mixed Borings, Turnings	10.50-11.00
No. 1 Cupola Cast	20.00
Breakable Cast	16.50
Low Phosphorus	21.00-21.50
Scrap Rails	20.50-21.00
Stove Plate	16.00-16.50

LOS ANGELES:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$14.00
No. 2 Heavy Melt. Steel	13.00
No. 1, 2 Deal. Bundles	12.00
Machine Turnings	4.50
Mixed Borings, Turnings	4.00
No. 1 Cast	20.00

SAN FRANCISCO:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$15.50
No. 2 Heavy Melt. Steel	14.50
No. 1 Busheling	15.50
No. 1, No. 2 Bundles	13.50
No. 3 Bundles	9.00
Machine Turnings	7.00
Billet, Forge Crops	15.50
Bar Crops, Plate	15.50
Cast Steel	15.50
Cut, Structural, Plate, 1", under	18.00
Alloy-free Turnings	7.00
Tin Can Bundles	14.50
No. 2 Steel Wheels	15.50
Iron, Steel Axles	23.00
No. 2 Cast Steel	15.50
Uncut Frogs, Switches	15.50
Scrap Rails	15.50
Locomotive Tires	15.50

LOGEMANN
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THE NATION NEEDS YOUR SHEET SCRAP!

In mills, industrial plants and scrap yards, LOGEMANN SCRAP PRESSES are working day and night to prepare sheet scrap for the furnaces.

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The scrap press illustrated operates in one of the largest industrial plants. Compresses scrap from three directions to produce high-density mill size bundles. Built in various capacities.

LOGEMANN BROTHERS COMPANY
3126 W. Burleigh St. **Milwaukee, Wisconsin**

NONFERROUS METAL PRICES

Copper: Electrolytic or Lake from producers in carlots 12.00c, Del. Conn., less carlots 12.12½c, refinery; dealers may add ¾c for 5000 lbs. to carload; 1000-4999 lbs. 1c; 500-999 1½c; 0-499 2c. Casting, 11.75c, refinery for 20,000 lbs., or more. 12.00c less than 20,000 lbs.

Brass Ingot: Carlot prices, including 25 cents per hundred freight allownace; add ¼c for less than 20 tons; 85-5-5-5 (No. 115) 13.00c; 88-10-2 (No. 215) 16.50c; 80-10-10 (No. 305) 15.75c; Navy G (No. 225) 16.75c; Navy M (No. 245) 14.75c; No. 1 yellow (No. 405) 10.00c; manganese bronze (No. 420) 12.75c.

Zinc: Prime western 8.25c, select 8.35c, brass special 8.50c, intermediate 8.75c, E. St. Louis, for lariots. For 20,000 lbs. to carlots add 0.15c; 10,000-20,000 0.25c; 2000-10,000 0.40c; under 2000 0.50c.

Lead: Common 6.3$c, chemical, 6.45c, corroding, 6.45, E. St. Louis for carloads; add 5 points for Chicago, Minneapolis-St. Paul, Milwaukee-Kenosha districts; add 15 points for Cleveland-Akron-Detroit area, New Jersey, New York state, Texas, Pacific Coast, Richmond, Indianapolis-Kokomo; add 20 points for Birmingham, Connecticut, Boston-Worcester, Springfield, New Hampshire, Rhode Island.

Primary Aluminum: 99% plus, ingots 15.00c del., pigs 14.00c del.; metallurgical 94% min. 13.50c del. Base 10,000 lbs. and over; add ½c 2000-9999 lbs.; 1c less through 2000 lbs.

Secondary Aluminum: All grades 12.50c per lb. except as follows: Low grade piston alloy (No. 122 type) 10.50c; No. 12 foundry alloy (No. 2 grade) 10.50c; chemical warfare service ingot (92½% plus) 10.00c; steel deoxidizers in notch bars, granulated or shot, Grade 1 (95-97½%) 11.00c, Grade 2 (92-95%) 9.50c to 9.75c, Grade 3 (90-92%) 8.00c to 8.25c, Grade 4 (85-90%) 7.75c; any other ingot containing over 1% iron, except PM 754 and hardeners, 12.00c. Above prices for 30,000 lb. or more; add ¼c 10,000-30,000 lb.; ½c 1000-10,000 lbs.; 1c less than 1000 lbs. Prices include freight at carload rate up to 75 cents per hundred.

Magnesium: Commercially pure (99.8%) standard ingots (4-notch, 17 lbs.) 2.50c lb., add 1c for special shapes and sizes. Allyo ingots, incendiary bomb alloy, 23.40c; 50-50 magnesium-aluminum, 23.75c; ASTM B93-41T, Nos. 2, 3, 4, 12, 13, 14, 17, 23.00c; Nos. 4X, 11, 13X, 17X, 25.00c; ASTM B-107-41T, or B-90-41T, No. 8X, 23.00c; No. 18, 23.50c; No. 18X, 25.00c. Selected magnesium crystals, crowns, and muffs, including all packing screening, barreiling, handling, and other preparation charges, 23.50c. Price for 100 lbs. or more; for 25-100 lbs., add 10c; for less than 25 lbs., 20c. Incendiary bomb alloy, f.o.b. plant, any quantity; carload freight allowed all other alloys for 500 lbs. or more.

Tin: Prices ex-dock, New York in 5-ton lots, Add 1 cent for 2240-11,199 lbs., 1½c 1000-2239. 2*c 500-999, 3c under 500. Grade A, 99.8% or higher (includes Straits), 52.00c; Grade B, 99.8% or higher, not meeting specifications for Grade A, with 0.05 per cent maximum arsenic, 51.87½c; Grade C, 99.65-99.79% incl. 51.62½c; Grade D, 99.50-99.64% incl., 51.50c; Grade E, 99-99.49% incl. 51.12½c; Grade F, below 99% (for tin content), 51.00c.

Antimony: American bulk carlots f.o.b. Laredo, Tex., 99.0% to 99.8% and 99.8% and over but not meeting specifications below, 14.50c; 99.8% and over (arsenic, 0.05%, max. and other impurities, 0.1%, max.) 15.00c. On producers' sales add ¼c for less than carload to 10,000 lb.; ½c for 9999-224 lb.; and 2c for 223 lb. and less; on sales by dealers, distributors and jobbers add ½c, 1c, and 3c, respectively.

Nickel: Electrolytic cathodes, 99.5%, f.o.b. refinery 35.00c lb.; pig and shot produced from electrolytic cathodes 36.00c; "F" nickel shot or ingot for additions to cast iron, 34.00c; Monel shot 28.00c.

Mercury: Open market, spot, New York, $103-$106 per 76-lb. flask.

Arsenic: Prime, white, 99%, carlots, 4.00c lb.

Beryllium-Copper: 3.75-4.25% Be., $17 lb. contained Be.

Cadmium: Bars, ingots, pencils, pigs, plates, rods, slabs, sticks, and all other "regular" straight or flat forms 90.00c lb., del.; anodes, balls, discs and all other special or patented shapes 95.00c lb. del.

Cobalt: 97-99%, $1.50 lb., for 550 lb. (bbl.); $1.52 lb. for 100 lb. (case); $1.57 lb. under 100 lb.

Indium: 99.9%, $7.50 per troy ounce.

Gold: U. S. Treasury, $35 per ounce.

Silver: Open market, N. Y. 70.625c per ounce.

Platinum: $35 per ounce.

Iridium: $165 per troy ounce.

Palladium: $24 per troy ounce.

Rolled, Drawn, Extruded Products

(Copper and brass product prices based on 12.00c, Conn., for Copper. Freight prepaid on 100 lbs. or more.

Sheet: Copper 20.87c; yellow brass 19.48c; commercial bronze, 90% 21.07c, 95% 21.28c; red brass 80% 20.15c, 85% 20.36c; phosphor bronze, Grades A and B 5% 36.25c; Everdur, Herculoy, Duronze or equiv. 26.00c; naval brass 24.50c; manganese bronze 28.00c; Muntz metal 22.75c; nickel silver 5% 26.50c.

Rods: Copper, hot-rolled 17.37c, cold-rolled 18.37c; yellow brass 15.01c; commercial bronze 90% 21.32c, 95% 21.53c; red brass 80% 20.48c, 85% 20.61c; phosphor bronze Grade A, B 5% 36.50c; Everdur, Herculoy, Duronze or equiv. 25.50c; Naval brass 19.12c; manganese bronze 22.50c; Muntz metal 18.87c; nickel silver 5% 26.50c.

Seamless Tubing: Copper 21.37c; yellow brass 22.23c; commercial bronze 90% 23.47c; red brass 80% 22.80c, 85% 23.01c.

Extruded Shapes: Copper 20.87c; architectural bronze 19.12c; manganese bronze 24.00c; Muntz metal 20.12c; Naval brass 20.37c.

Angles and Channels: Yellow brass 27.98c; commercial bronze 90% 29.75c, 95% 29.78c; red brass 80% 28.65c, 85% 28.86c.

Copper Wire: Soft, f.o.b. Eastern mills, carlots 15.37½c, less-carlots 15.87*c; weatherproof, f.o.b. Eastern mills, carlot 17.00c, less-carlots 17.50c; magnet, delivered carlots 17.50c, 15,000 lbs. or more 17.75c, less carlots 18.25c.

Aluminum Sheets and Circles: 2s and 3s flat mill finish, base 30,000 lbs. or more; del.; sheet widths as indicated; circle diameter 9" and larger:

Gage	Width	Sheets	Circles
.249"-7	12"-48"	22.70c	25.20c
8-10	12"-48"	23.20c	25.70c
11-12	26"-48"	24.20c	27.00c
13-14	26"-48"	25.20c	28.50c
15-16	26"-48"	26.40c	30.40c
17-18	26"-48"	27.90c	32.90c
19-20	24"-42"	29.80c	35.30c
21-22	24"-42"	31.70c	37.20c
23-24	3"-24"	25.60c	29.20c

Lead Products: Prices to jobbers; full sheets 9.50c; cut sheets 9.75c; pipe 8.15c, New York; 8.25c, Philadelphia, Baltimore, Rochester and Buffalo; 8.75c, Chicago, Cleveland, Worcester, Boston.

Zinc Products: Sheet f.o.b. mill, 13.15c; 36,000 lbs. and over deduct 7%; Ribbon and strip 12.25c, 3000-lb. lots deduct 1%, 6000 lbs. 2%, 9000 lbs. 3%, 18,000 lbs. 4%, carloads and over 7%. Boiler plate (not over 12") 3 tons and over 11.00c; 1-3 tons 12.00c; 500-2000 lbs. 12.50c; 100-500 lbs. 13.00c; under 100 lbs. 14.00c. Hull plate (over 12") add 1c to boiler plate prices.

Plating Materials

Chromic Acid: 99.75%, flake, del., carloads 16.25c; 5 tons and over 16.75c; 1-5 tons 17.25c; 400 lbs. to 1 ton 17.75c; under 400 lbs. 18.25c.

Copper Anodes: Base 2000-5000 lbs., del.; oval 17.62c; untrimmed 18.12c; electro-deposited 17.37c.

Copper Carbonate: 52-54% metallic cu, 250 lb. barrels 20.50c.

Copper Cyanide: 70-71% cu, 100-lb. kegs or bbls. 34.00c f.o.b. Niagara Falls.

Sodium Cianide: 96%, 200-lb. drums 15.00c; 10,000-lb. lots 13.00c f.o.b. Niagara Falls.

Nickel Anodes: 500-2999 lb. lots; cast and rolled carbonized 47.00c; rolled depolarized 48.00c.

Nickel Chloride: 100-lb. kegs or 275-lb. bbls. 18.00c lb., del.

Tin Anodes: 1000 lbs. and over 58.50c del.; 500-999 59.00c; 200-499 59.50c; 100-199 61.00c. **Tin Crystals:** 400 lb. bbls. 39.00c f.o.b. Grasselli, N. J.; 100-lb. kegs 39.50c.

Sodium Stannate: 100 or 300-lb. drums 36.50c, del.; ton lots 35.50c.

Zinc Cyanide: 100-lb. kegs or bbls. 33.00c f.o.b. Niagara Falls.

Brass Mill Allowances: Prices for less than 15,000 lbs. f.o.b. shipping point. Add ¾c for 15,000-40,000 lbs.; 1c for 40,000 or more.

Scrap Metals

	Clean Heavy	Rod Ends	Clean Turnings
Copper	10.250	10.250	9.500
Tinned Copper	9.625	9.625	9.375
Yellow Brass	8.625	8.375	7.785
Commercial bronze 90%	9.375	9.125	8.625
95%	9.500	9.250	8.750
Red Brass, 85%	9.125	8.875	8.375
Red Brass, 80%	9.125	8.875	8.375
Muntz Metal	8.000	7.750	7.250
Nickel Sil, 5%	9.250	9.000	4.625
Phos. br., A, B, 5%	11.000	10.750	9.750
Herculoy, Everdur or equivalent	10.250	10.000	9.250
Naval brass	8.250	8.000	7.500
Mang. bronze	8.250	8.000	7.500

Other than Brass Mill Scrap: Prices apply on material not meeting brass mill specifications and are f.o.b. shipping point; add ¾c for shipment of 60,000 lbs. of one group and ½c for 20,000 lbs. of second group shipped in same car. Typical prices follow:

(Group 1) No. 1 heavy copper and wire, No. 1 tinned copper, copper borings 9.75c; No. 2 copper wire and mixed heavy copper, copper tuyeres 8.75c.

(Group 2) soft red brass and borings, aluminum bronze 9.00c; copper-nickel and borings 9.25c; car boxes, cocks and faucets 7.75c; bell metal 15.50c; babbit-lined brass bushings 13.00c.

(Group 3) zincy bronze borings, Admiralty condenser tubes, brass pipe 7.50c; Muntz metal condenser tubes 7.00c; yellow brass 6.25c; manganese bronze (lead 0.00%-0.40%) 7.25c, (lead 0.41%-1.0%) 6.25c; manganese bronze borings (lead 0.00-0.40%) 6.50c, (lead 0.41-1.00%) 5.50c.

Aluminum Scrap: Price f.o.b. point of shipment, truckloads of 5000 pounds or over; Segregated solids, 2S, 3S, 5c lb., 11, 14, etc., 3 to 3.50c lb. All other high grade alloys 5c lb. Segregated borings and turnings, wrought alloys, 2, 2.50c lb. Other high-grade alloys 3.50, 4.00c lb. Mixed plant scrap, all solids, 2, 2.50c lb. borings and turnings one cent less than segregated.

Lead Scrap: Prices f.o.b. point of shipment. For soft and hard lead, including cable lead, deduct 0.55c from basing point prices for refined metal.

Zinc Scrap: New clippings 7.25c, old zinc 5.25c f.o.b. point of shipment; add ½-cent for 10,000 lbs. or more. New die-cast scrap, radiator grilles 4.95c, add ½c 20,000 or more. Unsweated zinc dross; die cast slab 5.80c any quantity.

Nickel, Monel Scrap: Prices f.o.b. point of shipment; add ½c for 2000 lbs. or more of nickel or cupro-nickel shipped at one time and 20,000 lbs. or more of Monel. Converters (dealers) allowed 2c premium.

Nickel: 98% or more nickel and not over ½% copper 26.00c; 90-98% nickel, 26.00c per lb. nickel contained.

Cupro-nickel: 90% or more combined nickel and copper 26.00c per lb. contained nickel, plus 8.00c per lb. contained copper; less than 90% combined nickel and copper 26.00c for contained nickel only.

Monel: No. 1 castings, turnings 15.00c; new clipping 20.00c; soldered sheet 18.00c.

Sheets, Strip . . .

Sheet & Strip Prices, Page 156

Sheet production by the few mills not strikebound is serving some regular customers but others are unable to get place on schedules, though many inquiries are received from far outside usual territory. Quotas are being set up for April by sellers generally but few promises are being made beyond that month. Mills plan to resume rolling where they left off and will take some time to rearrange schedules.

Pittsburgh—A flood of new orders and inquiries from customers regarding delivery status of present commitments, undoubtedly will develop immediately after termination of the strike. Producers intend to resume output where they left off and some state they will not alter production schedules for at least 30 days after operations are resumed for task of getting rolling schedules back to normal will be bad enough without further complicating the situation. Some mills have fairly impressive stocks of semifinished and production schedules can be resumed where they left off, but the ramifications of getting highly integrated steel operations back to prestrike schedules are vast and time-consuming. The only basic steel company here unaffected by the strike is American Rolling Mill Co.'s Butler, Pa., plant, with finishing capacity largely in sheets and strip. Three companies in the Pittsburgh area have resumed operations after being closed for varying periods. They are the Jessop Steel Co., Washington, Pa.; Universal-Cyclops Steel Corp., Bridgeville, Pa.; and Latrobe Electric Steel Co., Latrobe, Pa. The first two companies have resumed operations on an 18.5 cents an hour wage increase basis with the understanding that whatever agreement reached by U. S. Steel Corp. on this matter will prevail. The Navy Redistribution and Disposal office here will take bids Feb. 26 on 37,500 pounds of stainless steel sheets located at Carnegie-Illinois Steel Corp.'s McKeesport and Duquesne plants.

Cleveland — Inquiries as well as orders for flat-rolled products have declined, with some producers reporting a 50 per cent cut in bookings during the first two weeks of February compared with the like period in January. This lull is expected to last only for the duration of the steel strike and likely will be followed by a flood of business. Producers are unable even to approximate the time when deliveries can be made on some of the business now on file but unprocessed. Some mills, for instance, already are booked to capacity through next January on narrow strip while others are booked only through June. Generally, producers will restrict delivery promises to a maximum of 90 days and will continue to distribute output on the basis of past experience with individual customers. These voluntary allocation and quota systems may be modified by government regulation, as already has been the case in tin plate. One leading producer is of the opinion that only in this way will essential requirements, such as those of farm machinery manufacturers, be filled promptly.

Philadelphia—Apart from setting up quotas for April, because of the 45 days lead time, sheet producers still are not

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attempting to make definite commitments on future shipments. The nearest approach appears to be naming of a definite period dating from the end of the strike and some producers assert they are in no position to do even that, because of uncertainty as to when they will get back into stride following formal strike settlement. Except for unpolished stainless sheets little sheet tonnage of any description is available before fourth quarter on the basis of the present outlook. In fact, various producers are practically covered for the remainder of the year.

Birmingham—Sheets have consistently been one of the district's tightest products with supplies inadequate since V-J Day. Steel sheets have not been available in sufficient quantity for regular users and at least one new user found no available supply here a few weeks ago. Roofing sheets will be even scarcer with more favorable weather conditions.

New York — Sheet sellers generally have set up quotas for April because of the lapsing of the 45-day lead time late last week. Little of a definite nature is being quoted for shipment beyond because conditions are still too confused. Generally speaking, producers who have not been quoting on a quarterly quota basis, are tentatively offering fourth quarter shipment on hot and cold-rolled sheets, with little available even in that period on galvanized sheets, electrical sheets and polished stainless sheets. Unpolished stainless sheets, however, are available late in second quarter and early third quarter, on the basis of the present outlook.

Cincinnati — Sheet production continues steady at the one district mill not shut down by the strike, with deliveries held fairly close to original schedules. Second quarter schedule has not been fixed and undoubtedly some adjustments must be made therein as a result of the strike, which has suspended output in some units of the same company. Despite a drop in new inquiry, mills have an immense backlog. Delivery promises are impossible; in fact, most orders have been filed and not definitely placed on schedules.

Boston—Two producers of narrow cold strip have maintained schedules after a fashion during the strike, although dipping substantially into inventories of hot strip. A limited number of sheet consumers supplied by the few mills not affected by stoppage also have received tonnage near schedule, due in part to suspensions to automobile and electrical equipment shops. On the whole, however, shortages of sheets and strip after the strike will be acute. Among the larger fabricators of flat-rolled material in this district, however, electrical equipment shops, have been idle and stocks are sufficient for resumption of production of some finished products.

Steel Bars . . .

Bar Prices, Page 156

Delivery promises on new bar business are tentative and buyers not long on books find difficulty obtaining any promises before late in third quarter on hot carbon bars, in a limited number of sizes. In very small sizes little is offered before the end of the year. Alloy bars are being promised generally for second quarter. Cold-drawn bars are promised for second and third quarter.

New York — Because of the 45-day lead time required in setting up schedules, bar sellers have established their quotas for April shipment. The situation is still too confused for producers to set up definite schedules further, as they are not confronted by the absolute necessity for doing so. Only buyers whose orders have long since been on the books under the quota system that prevailed prior to the strike will benefit in any measure by the schedules recently set up for April.

Buyers of hot carbon bars who are not already on books find it difficult to obtain even tentative promises from mills of shipments before late in third quarter and even then not a wide variety of sizes is offered. In fact, in the very small sizes most sellers have little to offer before the end of the year. Cold-drawn bar promises run late in second quarter and early third quarter, for the most part. Some cold drawers are tentatively quoting deliveries beyond that in small sizes. Alloy bars are being tentatively promised for early second quarter in most instances.

Cleveland — Bar consumers are resigned to the fact that producers are unable to give them further information regarding future deliveries and, therefore, have reduced inquiries and orders. Some business is still being received, constituting in many instances the routine recording of specifications on material which had been reserved for a particular account. Tonnage booked by one leading producer in the first two weeks of February was about 50 per cent of that booked in the like period last month. A slight increase in alloy bar orders was noted, indicating that consumers are gradually shifting from carbon grades in order to get earlier deliveries. Some mills are booked through the fourth quarter.

Standard Oil Co. of Ohio recently placed an order for 350 tons of concrete bars with a warehouse for a separator tank at Toledo.

Pittsburgh—General policy of carbon and alloy bar consumers to conserve inventories until termination of the steel strike has resulted in general tapering in operations at these plants. Considerable pressure is expected for preference on immediate post-strike deliveries, particularly from steel distributors. New orders continue to be placed in fair volume for delivery at mill convenience, but overall tonnage of new business is well below pre-strike level for many metalworking plants are under USA-CIO contracts and therefore shut down. Latrobe Electric Steel Co., Latrobe, Pa., has resumed operations, but no details of the agreement are available. This interest is the lone bar producer operating in the Pittsburgh area. Bids will close Feb. 20 on 78,000 pounds of surplus hot-rolled bars, 440,500 pounds of blooms, and 256,500 pounds of billets; all material located at Carnegie-Illinois Steel Corp's Duquesne Works.

Boston—Replacement of alloy bar inventories will be ahead of that in carbon material, notably in small sizes, for which demand is heaviest. Drawing on carbon reserves also has been greatest and most fabricating shops, including forging plants, have been in production. In some instances rather topheavy alloy stocks held by distributors have been reduced, stimulated by revisions in specifications, due largely to limited supply of carbon.

Philadelphia—Hot carbon bar deliveries appear seven to eight months off, with some producers quoting nine to ten months on small sizes. Cold drawers are quoting tentatively four to six months and producers of hot alloy bars two to three months.

Steel Plates . . .

Plate Prices, Page 157

Plate mills generally find deliveries are at least six months off, while in some instances a little is available for third quarter, with most fourth quarter output covered in some cases. Bids on steel for three Maritime Commission ships are delayed because mills are unable to quote firm prices under present circumstances.

Philadelphia — While demand for plates, with all other products, has been affected by the steel strike, some producers have booked tonnage well in excess of capacity lost by the strike. Most plate mills estimate shipments as six months off. At the same time, others have little left in third quarter and report that most of their fourth quarter output is covered. Demand for $\frac{3}{16}$ and ¼-inch plate appears as urgent as ever from fabricators of underground storage tanks, carbuilders and warehouses. Mills still are moving slowly in acceptance of this light plate and in various instances insist that orders be accompanied by a certain amount of heavier gage tonnage, this being particularly true in bookings by jobbers. Export demand for plates dropped sharply during the steel strike, although one eastern producer is out of the market for export tonnage for the remainder of the year. A district shipyard is asking bids on 39,000 tons of steel, including 34,500 tons of plates, for three combination cargo-passenger ships for the Maritime Commission. However, as firm prices are sought, some producers, at least, are refusing to submit bids.

Boston — While deliveries of pressed and spun heads will have lengthened to 14 to 16 weeks, they will be available in balanced volume before plates, to fabricating shops. Meanwhile, lack of heads in some diameters is hampering operations with several tank fabricators. Most plate ships have been in production during the stoppage, but became increasingly pinched for some sizes. Plate mills are booking space for future rolling and inquiry includes tonnage for one New England railroad for car repairs. Expected shortage of pig iron for heavy castings is expected to stimulate demand for heavy plates for weldments by next quarter.

Seattle—Contracts already placed are being handicapped by inability to obtain material, an example being a penstock for Seattle city light department, requiring 500 tons of plates. Some plates are available at times from shipyard surplus.

Birmingham — Discouragement, more than anything else, it is reported, has whittled down the volume of plate offerings, although the need for the item has scarcely diminished in this section. Mills have a large hold-over backlog

already on books and are not making definite commitments.

Tubular Goods . . .

Tubular Goods Prices, Page 157

Cleveland — Information received by leading pipe producers here indicates that their jobbers' stocks have been completely sold. This indicates that pressure for deliveries immediately following the strike will be the heaviest in history. To meet this demand, producers will continue to distribute most of their production through jobbers on a quota basis. Most demand has been for small sizes of butt-weld pipe but producers will continue to follow the order pattern of a base period in determining distribution. Depending upon when pipe mills will be able to resume the prestrike rate of operations, the February quotas will become the March or April quota.

Seattle—Cast iron pipe inquiry is active but agencies can not promise definite delivery, causing many projects to be postponed. H. C. Purcell, Seattle, has taken 209 tons for the Metzger water district at Portland, Oreg. King county district will open bids Feb. 19 for 5800 feet of 6-inch cast iron pipe, hydrants and valves. Bids have been opened at Vancouver, Wash., on an unstated tonnage of 4 and 6-inch cast pipe. Tacoma, Wash., has opened bids for 2180 feet of 20-inch and 1000 feet of 12-inch cast pipe and fittings.

Wire . . .

Wire Prices, Page 157

Boston—Availability of wire rods is expected to be the major problem in resumption of wire mill operations. Already limited before the strike, any improvement in supply because of price advance is conjectural. Both rods and drawn wire will be under strict allocation. Fabricators will have slight chance of obtaining all tonnage requested and substantial rescheduling of production will be unavoidable. Worcester has been made a base for wire nails by American Steel & Wire Co., at $6 per ton over Pittsburgh. Three wire mills have managed to continue production during the strike, including the primary steel producer in Rhode Island.

Birmingham—Pressure for wire products will increase measurably from now on through the spring and summer seasons and backlogs will mount considerably as soon as mills arrange their bookings. Even before the strike, marked shortages were evident in most wire products, especially in fencing. Smaller manufacturers dependent upon drawn wire are hard pressed and have been forced to curtail production in most instances.

Rails, Cars . . .

Track Material Prices, Page 157

New York — Included in scattered awards are 75 caboose cars for the New York, New Haven & Hartford placed with Harlan & Hollingsworth Corp., Wilmington, Del. Pennsylvania railroad has placed one 6000-horsepower diesel-electric locomotive with Baldwin Locomotive Works. The Pennsylvania railroad has placed 57 passenger train cars with American Car & Foundry

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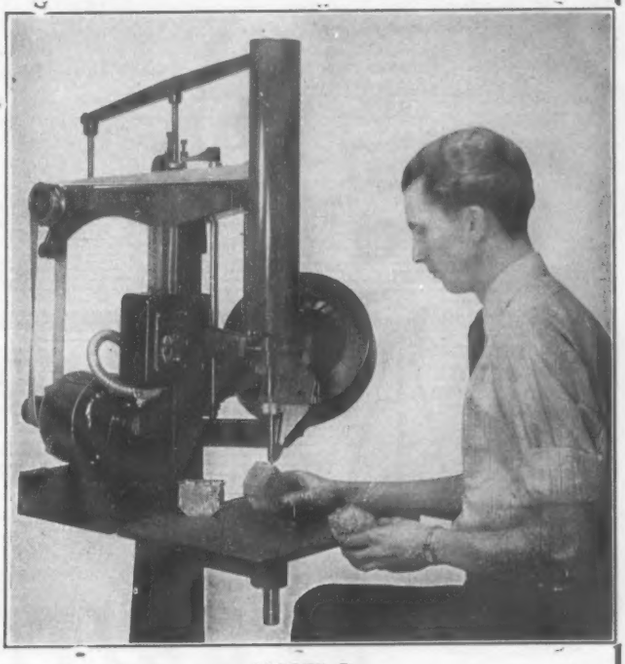

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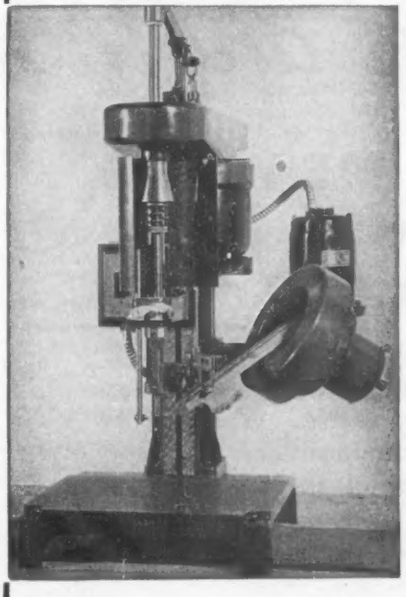

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Bolts, Nuts . . .

Bolt, Nut, Rivet Prices, Page 157

New York — Approximately $7 million worth of turnbuckles, bolts, nuts and screws are being offered by the Consumer Goods Division, War Assets Corp., the products representing surplus government property. Included, it is said, are 365,000 turnbuckles in various sizes and shapes.

Tin Plate . . .

Tin Plate Prices, Page 157

Pittsburgh — Present low tin plate inventories indicate that output of this product will be under forced draft in the immediate poststrike period to meet peak food pack requirements expected during July and August. The CPA program for concentrating production of tin mill products suitable for use in making cans and closures, with special preference given to orders for products which will be used to make cans for packing perishable or seasonable food products, might result in a reduction of other products such as black plate and terne plate. It is pointed out that tin plate production could not be resumed on a prestrike basis until at least five weeks after termination of the strike. Plans for increasing tin plate output when mill operations are resumed may be at the expense of sheet and strip output at some mills. Another indication of the anticipated critical supply situation in tin plate is the recent suspension of 215,500 tons of tin plate scheduled for export during first half.

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Structural Shapes . . .

Structural Shape Prices, Page 157

Cleveland — Continued uncertainty as to future deliveries of plain structurals is restricting activity in independent fabricating shops. Some estimating and detailing departments are making rapid headway against the heavy backlog piled up between V-J Day and the beginning of the steel strike. Fabricators are still short, however, of engineering help. Warehouse stocks of structurals are generally being reserved for repair and maintenance and no longer constitute a source of supply for new construction. Warehouses have long lists of inquiries for structurals and are at least two weeks behind schedule on shipments.

Good progress has been made in Cleveland's campaign to improve navigation on the Cuyahoga river. The War Department has approved a $13,236,000 program for replacing six narrow railroad bridges and rebuilding another, which have impeded navigation. The Senate committee on commerce and the House Rivers and Harbors Committee now have on file the recommendation, including apportionment of expense. It is uncertain at this time when congressional action will be taken and when the structural steel bids will be sought.

New York — Bookings of fabricated structural steel for bridge and building construction during 1945 amounted to 1,114,087 tons, or an increase of 77 per cent over the 628,877 tons for the preceding year, according to the American Institute of Steel Construction. Shipments last year increased to 797,441 tons compared with 597,872 tons in 1944.

December bookings of 108,084 tons declined slightly from 117,755 for the preceding month. Reported tonnage available for future fabrication December 31 increased to 375,162 tons.

A recent outstanding award involves approximately 2700 tons for an office building for Tishman Realty Co., Park avenue and 57th Street, placed with Bethlehem Steel Co., Bethlehem, Pa.

Seattle—Lack of steel is delaying many major construction and reconversion projects in this area. Fabricating shops find difficulty in obtaining material, either from mills or warehouses, shapes and reinforcing steel being practically exhausted.

Boston—Shortage of plain material in wanted sizes, notably in the smaller ranges, beams, channels and angles, promises to account for major delays in post-strike fabricated structural steel contracts. District shops, by drawing on limited warehouse stocks, for the most part will meet immediate obligations, but will be pinched later. Several larger tonnage projects are not too badly retarded, by continued operations at fabricating shops at Elmira, N. Y., and Trenton, N. J. Most contracts include escalator clauses covering price increases, but promises on delivered fabricated material range between four and five months after

termination of the strike. Active current inquiry is off but contracts include 2500 tons placed by Stone & Webster Engineering Corp. for projects outside the district.

Philadelphia—Shape mills have little tonnage available in first half and schedules are expected to expand sharply when general conditions become more stable. A volume of building construction is ready for release as soon as costs and deliveries can be more accurately gaged.

Pig Iron . . .

Pig Iron Prices, Page 159

Curtailed production of pig iron is causing more foundries to taper consumption to conserve supply to maintain operations after close of the strike and resumption of pig iron production. Blast furnaces still operating are besieged by requests for additional iron but with output being rationed to regular customers this has little result. Shortage of iron is expected to last well through the year.

Pittsburgh — Additional foundries began tapering production schedules last week in an effort to conserve rapidly dwindling pig iron inventories, as they are fully aware of the time lag necessary before pig iron output can be returned to normal following termination of the strike. Shortage of cast scrap has restricted effort of many foundries to increase the proportion of scrap in their melt. Blast furnaces still operating in other areas are flooded with inquiries, and despite the fact they are rationing output to regular customers, their inventories are steadily declining. Adequate supply of foundry coke is reported, with most beehive ovens switched from blast furnace to foundry coke. Melters are expected to continue rationing pig iron to the merchant trade for a long period after operations are resumed.

Buffalo — Leading merchant iron sellers predict a pig iron shortage for the remainder of 1946. Concern is expressed as many foundries, not closed by strikes, are pushing operations until inventory stocks are entirely used up. Sellers anticipate extra pressure from these consumers for iron to resume operations. In addition, an urgent demand is likely from mills rushing to resume ingot production. Bethlehem's Lackawanna mill especially is expected to call for increased shipments of iron because of the advanced walkout of workers which left blast furnaces untended and damaged to a point where it will take approximately two months to resume normal operations after the strike ends. Many foundries report that iron supplies are running out and even though workers are not on strike, melting operations will be halted soon.

Boston — Inventories are badly out of balance; some foundries have worked off reserves to a low point while others have managed to stretch out supply to a remarkable degree. Shops down since the strike will have relatively the largest stock of iron when deliveries again come through, when pressure for iron will be intense, with minor exceptions, from all directions. Indications are some consumers will have to curtail for a period until blast furnaces are able to get into full production to ease accumulated demand.

Cincinnati — Melt in foundries not directly hit by strikes is being sustained close to prestrike levels, although the pig iron supply for some is precarious. Those listed as regular customers of furnaces are receiving tonnage on a basis of January shipments but even these melters, in face of eager demand for castings, find inventories declining. Supplies of by-products foundry coke in this district are adequate.

Cleveland — Foundries have reduced their work week and have revised the composition of melt to conserve dwindling pig iron stocks. They are having increasing difficulty, however, in securing cast scrap. Most foundries still have sufficient raw material supplies to sustain operations at the reduced rate for another three weeks. Inquiries for castings are well maintained, although some are being stockpiled rather than being used immediately for production of finished products.

Philadelphia—Where blast furnaces have been banked and not blown out completely it appears that at least a week will elapse after the men return to work before they can start producing a satisfactory grade of basic iron. However, they should get into production of foundry iron within two or three days and some will stay on foundry grades for a while as many foundries have been

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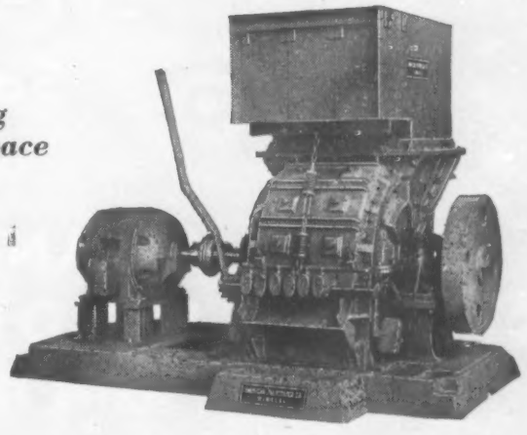

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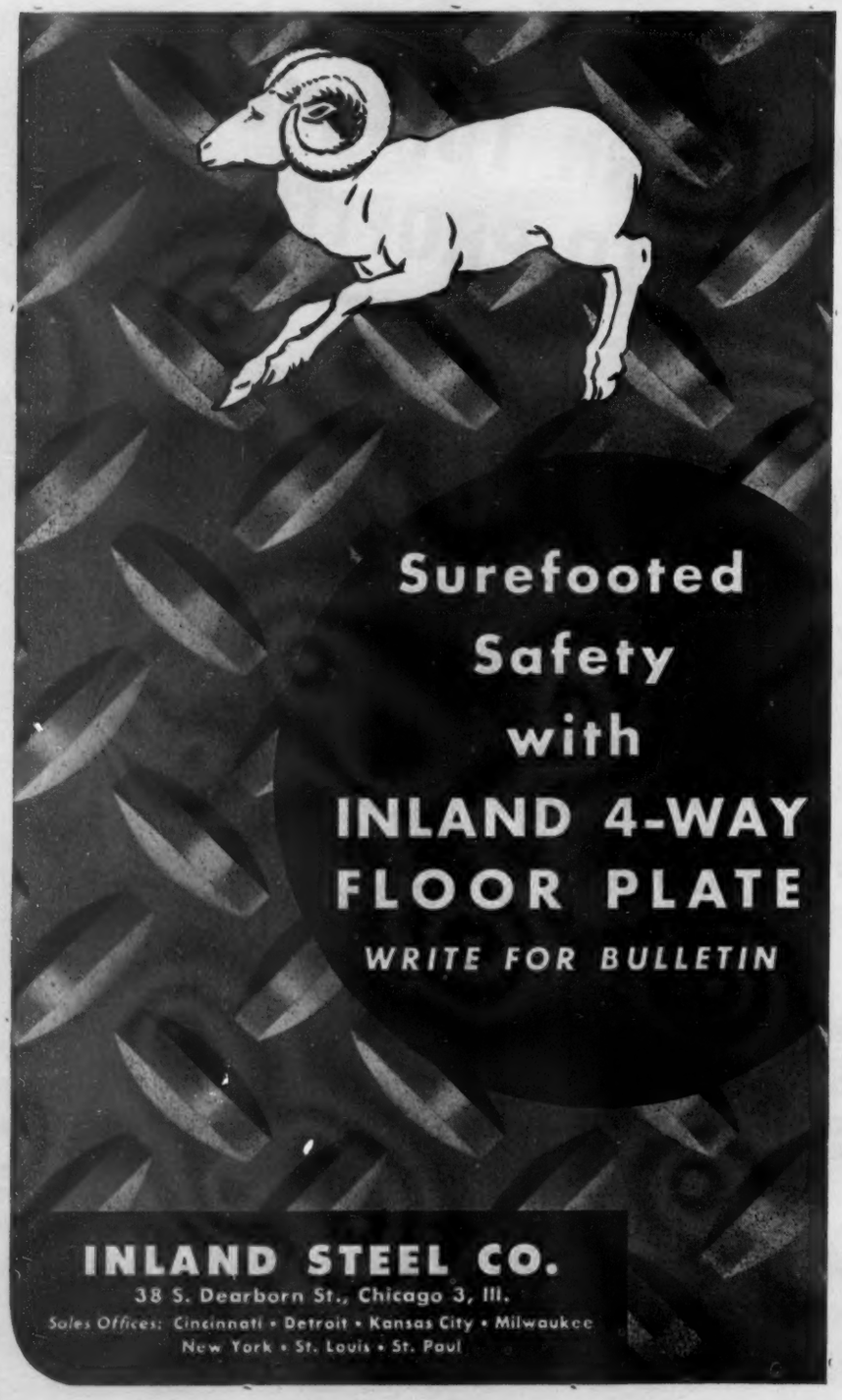
able to keep going through the steel strike and stocks are low and pressure is heavy. Nevertheless, steel mills are badly in need of basic and one seaboard furnace, which has been able to continue in operation since the beginning of the steel strike on foundry iron, plans to shift back to basic promptly. Pig iron sellers expect a tight situation for some time.

New York—The relatively small volume of pig iron being produced for this area is moving somewhat better since the tugboat strike ended. However, with production at low ebb various consumers are having to curtail operations further. Most foundry iron consumers expect a lag in shipment of iron after the steel strike ends.

Local foundries are pressing for cast scrap but trade leaders expect a continued shortage in cast grades for several months.

Chicago—Despite the fact that the steel strike has gone through four weeks, no foundries in this area are known to have been forced to shut down from lack of pig iron. This is due partly to the fact that five of the nine blast furnaces operating here are not strike-bound, therefore can ship iron. However, iron inventories in hands of melters are desperately low and unless the strike ends quickly, closings are not far away. In a few cases, foundries have obtained directives for iron from active blast furnaces. Shortage of metallurgical coke in some instances is more acute than iron, for supply is appreciably affected by the strike. It will be a matter of some days before shipments of iron and coke can resume after the steel plants resume operations.

Birmingham—The situation in steel has contributed a little measure of relief to the pig iron picture here and there, although pig iron generally is as tight as ever. Seven blast furnaces are on merchant iron in this district. Production is not up to expectations, it is indicated, due partly, it is believed, to the generally demoralizing effect of the strike in steel.



Scrap . . .

Scrap Prices, Page 160

Conditions in the steel and iron scrap market are static in view of the steel strike, which limits shipments. Every effort continues to be made by melters to obtain possession of tonnage for post-strike use. Volume of scrap moving to dealers is limited, many steel fabricators being closed by lack of material, thus reducing output of industrial scrap.

Pittsburgh — Movement of production scrap receded further last week, due to additional plants curtailing operations. Dealer intake of unprepared material is insignificant and is lending little impetus to the general scrap volume moving here. Current scarcity of scrap has accentuated the tightness noted prior to the strike. Mill scrap inventories were at relatively low levels before the strike. Although some mills are storing scrap at depots near consuming points or in dealers' yards the movement during the strike period has been so light that even in these few instances not much improvement in scrap inventories is indicated. Prospect of higher steel prices probably will bring additional pressure for higher prices for scrap originating from metalworking plants. If this effort is successful a compensatory rise in scrap price ceilings at which dealers dispose of their material would be necessary. At present a $3.50 per ton spread is allowed for preparation by dealers.

Buffalo — Several foundries in this area which have been able to escape the labor walkout are on the verge of closing as cast scrap supplies have reached the exhaustion point and pig iron is not available. Strength pervades the scrap market as mills and smaller consumers continue to press dealers for material despite suspension of ingot operations. With little coming into their yards, dealers report supplies dwindling as processing continues at recent levels. Mills have stopped shipments into their yards. While dealers are filling mills' requests to bundle and hold scrap until the steel strike ends, shipments are reported to the Valley and Pittsburgh area.

Cincinnati — Tonnage of iron and steel scrap coming out is smaller, with all offerings taken readily. A few holdups in the district and nearby have not appreciably eased the situation. One district mill, strike-bound, is piling scrap and another, actively melting, is trying to expand inventory. Foundries, pinched for pig iron, are absorbing all offerings and avidly seeking more cast scrap. Prices are firm at ceiling.

Cleveland — Scrap consumers have not abated efforts to obtain tonnage, seeking to build inventory to bridge the period after ingot production is resumed, before industrial scrap supply

starts to come out. With steelmakers in this area completely idle most shipments now move to other areas, where the strike has not stopped mill operations. Renewed buying is expected to follow end of the strike as melters prepare for high rate of steelmaking.

Boston — Demand for foundry grades holds strong as well as for heavy melting steel, although an embargo was placed on the largest consumer in the Worcester area. The one basic steel works operating all through the strike is in the market for scrap. Supply of industrial scrap is declining. Scattered about is considerable terminated contract material which eventually will go to scrap, due to outdoor storage.

Seattle — No interest is shown in the scrap market as shipments are being held back until mills resume. In the meantime there is practically no turnover.

Birmingham—Weather conditions over the past weeks have been the major cause for lack of improvement in the district's scrap picture. A general shortage of labor contributes. The market remains tight, with ceiling prices generally applicable.

Philadelphia—In scrap, even where mills have been able to build up inventories, they will probably exert strong pressure on suppliers for direct shipments as stock in most instances has been stored in yards away from plant properties and must be rehandled, with resultant delay. Mills unable to store scrap, and there have been many such, for some time have endeavored to set up special arrangements for purchase of unprepared scrap, wherever it may be, for later processing at scrap yards. However, such plans have not been very successful and the consumers have had to content themselves largely with the thought that while some mills have not been able to store scrap the number will be reduced by just that number among those which will have to have shipments before they can get under production.

New York—Ending of the tugboat strike has eased shipments of scrap in the metropolitan area. Brokers, however, declare that until the steel strike is definitely concluded shipments will be relatively restricted. Heavy melting steel is being shipped to eastern Pennsylvania where it is being stored despite suspension of operations and to Sparrows Point and at least two destinations in the Pittsburgh area. Shipments of melting steel to Lackawanna continue at a standstill with little change expected for some time, even after the strike ends, as stocks on hand are understood to be fairly substantial and it will require the leading consumer in the Buffalo district several weeks to get back to normal operation.

Chicago—Continuation of the steel strike has not eased demand for scrap. Mills are actively seeking all the material they can get and show no hesitation in reaching far afield for it. Each week the production of scrap here declines as manufacturing establishments curtail operations as inventories of steel run out. This decline will continue several weeks after mills resume operation because mill shipments of steel will be only a trickle for a good period. Scrap consumers are accepting delivery on material and are piling it at docks o rout-of-plant locations. Prices hold firmly at ceiling.

Warehouse . . .

Warehouse Prices, Page 158

Pittsburgh — The few steel distributors here not shut down because of the strike report inventories nearly depleted despite careful rationing of limited stocks to regular customers and for emergency repair needs. One interest is out of sheets and strip in lighter gages, another is sold out of nails and pipe. There are still some sizes of hot-rolled and cold-finished bars, while track spikes also are still available. No decision has been reached as to whether steel distributors will be given preferential deliveries on present mill commitments following termination of the strike. Also unanswered is the question of whether steel distributors will be able to pass along to their customers the increase in mill prices. Volume of new inquiries has receded substantially the past ten days for most metalworking companies have become reconciled to fact that steel from warehouse stocks is no longer available except for emergency needs.

Many small plants soon will get relief from the critical steel shortage through efforts of WAC to put on the market promptly an estimated 1.7 million tons of steel which is being declared surplus by the Army and Navy. The steel is expected to be allocated

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among steel distributors until production is resumed and reaches pre-strike levels.

Cleveland — Warehouse stocks are now badly out of balance, although on a tonnage basis they are only 30 to 60 per cent below the prestrike level. Despite strict rationing warehouses have been completely cleaned out of certain sizes and gages. Demand has dropped sharply during the past week. This is attributed to the fact that some consuming plants have shutdown completely for the duration of steel strike, other consumers have curtailed operations, and still others have discovered that warehouses have no stocks of material which they require. Chief concern of warehouses at present is amount of increase they will be allowed in prices following the increase in mill prices.

Cincinnati — Jobbers' steel stocks are dwindling even through tonnage is being doled out to prevent absorption of remaining tonnage. Some items are already exhausted, and all inventories unbalanced. The surge of inquiries, many from potential customers far out of this sales territory, has subsided.

Boston—By supplying shortages on some grades and sizes warehouses have enabled several fabricating plants to maintain operations but secondary distribution is tightening. Warehouses are becoming short of some products and are uncertain as to replacements. Not for a month after production is resumed are replacements of some products expected in volume sufficient to meet demand.

Philadelphia — Reflecting decline in metalworking as a result of disturbed labor conditions and stock conservation measures employed by jobbers at the request of Washington, some Philadelphia warehouses report business off about 20 per cent from first half of January, while incoming tonnage was down more than 80 per cent.

Chicago—Warehouses are obliged to sell steel more sparingly as the steel strike drags out. In the main, consumers are reasonable in their requests for material, for they recognize there is no hope of getting quantities sufficient to maintain their assembly lines. Furthermore, there are few consumers who have not had to curtail their operations for lack of certain items of steel, or components from the electrical industry also on strike. Sheets of all descriptions are next to impossible to obtain from warehouse.

Canada . . .

Toronto, Ont. — Comparatively little change is seen in the Canadian iron and steel markets. Demand for all classes of steel continues well in excess of supply with no indication of easing. While some steel producers are not accepting additional business at this time, others are taking orders but are making no promise of delivery and continue to specify prices to be made known at time of shipment. The increase in price of nails, announced last week, has not been followed by direct advances in pig iron or steel prices, other than the discontinuance of discounts in payments. Despite the fact that production is being stepped up, output of steel is only about 50 per cent of actual requirements. Suspension of deliveries of steel into Canada from the United States has been reflected in curtailed operations by a

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number of Canadian companies and others plan labor lay-offs unless new supplies of steel are available to enable them to maintain operations.

Sheet supply is tight in all districts and producers are not accepting orders on either black or galvanized, pointing out that they have no unfilled capacities for this quarter and that their carryover already extends well into May and June.

Demand for carbon bars continues at a high level and producers are allocating supplies to keep as many customers as possible in operation. According to word from Ottawa, the government is not considering a return to a priority policy for distribution. Makers of alloy bars also report a heavy outpouring of new orders.

Production of iron and steel in Canada for December showed a small gain over November. Output of steel ingots and castings in December totaled 219,281 net tons or 72.6 per cent of capacity, against 207,981 tons or 68.8 per cent in November. Production of steel ingots and castings for the full year 1945 fell below the total for the two years immediately preceding. Pig iron output for December totaled 135,225 net tons, 58.5 per cent of rated capacity, and compares with 134,651 tons or 58.3 per cent in the previous month and 139,152 tons in December 1944. For the year 1945 pig iron production totaled 1,777,958 net tons, against 1,852,628 tons in 1944. Production for the year included 1,421,243 tons of basic iron, of which 85,395 tons were for sale and the remainder for further use of producers; 198,293 tons of foundry iron, all for sale and 158,422 tons of malleable iron, all for sale. Further comparisons follow, in net tons:

	Steel ingots, castings	Pig iron	Ferro-alloys
Dec. 1945	219,281	135,225	15,456
Nov. 1945	207,981	134,651	13,360
Dec. 1944	243,482	139,152	12,391
12 Mos. 1945..	2,881,323	1,777,958	186,978
12 Mos. 1944..	3,024,410	1,852,628	182,428
12 Mos. 1943..	2,996,978	1,758,265	218,687

Problems Following Strike Expected To Be Complicated

(*Continued from Page* 62)

after the steel mills reopen before most metalworking firms can build up inventories sufficiently to resume normal operations.

On top of the difficulties imposed by the steel strike last week, there was added the confusion caused by power and transit strikes in three large eastern centers.

New York was shut down in all but essential services Feb. 12 as Mayor William O'Dwyer issued a drastic fuel conserving edict, necessitated by a strike of tugboat workers. The order was revoked after 18 hours.

Philadelphia was without public transportation during a two-day strike Feb. 11 and 12 by employees of the Philadelphia Transportation Co. Despite the absence of trolleys, busses and elevated trains, a large majority of workers reached

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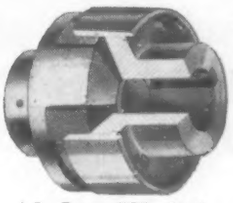

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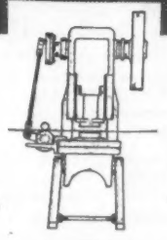

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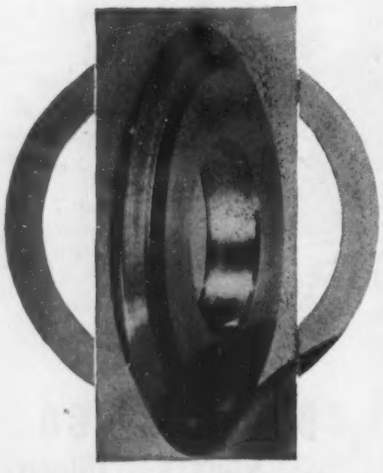

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Pittsburgh was paralyzed for 19 hours on Feb. 12 by a strike of 3400 workers at the Duquesne Light Co., which cut off power and light in Pittsburgh and surrounding communities. Strike ended with an agreement to mediate the dispute.

General Motors Corp. signed an agreement with 25,000 CIO electrical workers providing for a wage increase of 18½ cents an hour. This agreement drew a bitter denunciation of the electrical workers by the GM United Automobile Workers who termed the electrical workers' action a "dirty double-cross."

GM auto workers rejected a company offer of a similar wage increase, 18½ cents an hour, and union spokesmen declared they would hold out for the 19½ cents suggested by the President's fact-finding board.

The company's offer would have been effective as of the date the strike was terminated, and pending negotiation of a new contract an interim agreement would have been set up consisting of the canceled contract from which all War Labor Board directives inserted during the war year would have been excluded.

On the matter of a new contract, GM said it would be agreeable to a checkoff system for collecting union dues but would require guarantees of uninterrupted and efficient production and elimination of maintenance of membership provisions.

Salaried employees of GM were presented with an additional 5 per cent wage increase effective Feb. 15, making a total of 15 per cent granted since November.

Willys-Overland Motors Inc., Toledo, granted members of three unions an interim wage increase of 10 cents an hour, to remain in effect until the automotive wage picture is clarified, after which the wage question will be renegotiated.

STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PLACED

2700 tons, office building, Tishman Realty Co., Park avenue and 57th St., New York, to Bethlehem Steel Co., Bethlehem, Pa.

1500 tons, miscellaneous plant construction, Carbide & Carbon Chemical Co., Texas City, Tex., to Mosher Steel Co., Houston, Tex., and the Consolidated Steel Corp. Ltd., Los Angeles.

1450 tons, powerhouse at refinery of Standard Oil Co., Whiting, Ind., to American Bridge Co., Pittsburgh, through Stone & Webster Engineering Corp., Boston.

1400 tons, sheet piling, shore protection, Calumet Park, Chicago, for Chicago Park District, 700 tons to Carnegie-Illinois Steel Co., Chicago, and 700 tons to Inland Steel Co., Chicago; Great Lakes Dredge & Dock Co., Chicago, contractor; bids Dec. 11.

1300 tons, expansion, Peoria, Ill., for Pabst Brewing Co., to Mississippi Valley Structural Steel Co., Decatur, Ill.; James McHugh Construction Co., Chicago, contractor; bids Jan. 17.

1000 tons, American Suppliers Inc., tobacco warehouse, Durham, N. C., to Bethlehem Steel Co., Bethlehem, Pa.

1000 tons, plastic processing plant, B. F. Goodrich Co., Marietta, O., to Bethlehem Steel Co., Bethlehem, Pa.

560 tons, building for Raytheon Corp., Burlington, Iowa, to American Bridge Co., Pittsburgh, through Jackson & Moreland, engineers, Boston.

475 tons, building for Lever Bros., Cambridge, Mass., at Hammond, Ind., to American Bridge Co., Pittsburgh, through Stone & Webster Engineering Corp., Boston.

400 tons, building for National Research Corp., Cambridge, Mass. to Lehigh Structural Steel Co., Allentown, Pa., through Thomas O'Connor & Co., general contractor, Boston.

370 tons, plant addition, Federal Telephone & Radio Co., Nutley, N. J., through George H. Fuller Co., New York, to American Bridge

350 tons, addition to parts warehouse, Minneapolis, for General Motors Corp., to American Bridge Co., Pittsburgh.
Co., Pittsburgh.

320 tons, laboratory, Allied Chemical & Dye Co., Morristown, N. J., to Deleson Steel Co., Englewood, N. J.

230 tons, plant addition, Burnham Boiler Co., Lancaster, Pa., to Belmont Iron Works, Philadelphia.

100 tons, telephone building, Sharon Hill, Pa., to Bethlehem Steel Co., Bethlehem, Pa.

Unstated, Coast Guard airport control tower at Port Angeles, Wash., to Hendrickson Construction Co., Seattle.

STRUCTURAL STEEL PENDING

1250 tons, hotel and apartment building, Houston, Tex.; Stone & Webster, Boston, engineers.

1200 tons, Sloane Memorial hospital, 68th street and York, New York, bids asked.

600 tons, grain elevator, Port Authority of New York, Brooklyn, new bids asked.

400 tons, warehouse, Vernon, Calif., for Pacific Press Inc.

300 tons, state bridges in Cowlitz and Clallam counties, Washington; bids in Feb. 14.

160 tons, addition, Provident Trust Co., Philadelphia.

135 tons, conveyor bridges and other work, National-American Cement Co., Berkley, Pa.

124 tons, 123rd street viaduct, Chicago, for Cook county; bids Jan. 21 and American Bridge Co., Pittsburgh, low; project abandoned.

110 tons, St. Ann's church, Washington.

100 tons, alterations, Altmans department store, Fifth avenue, New York, bids asked.

Unstated tonnage, plant, General Baking Co., New Brunswick, N. J., bids asked.

Unstated, 618 foot span, King county, Washington; bids to State Highway Commission, Olympia, Feb. 26.

REINFORCING BARS . . .

REINFORCED BARS PLACED

360 tons, power house, Alma, Wis., for Dairyland Power Co-operative, to Bethlehem Steel Co., Bethlehem, Pa.; La Crosse Dredging Corp., Chicago, contractor; bids Jan. 18.

240 tons, packing plant addition, Fort Dodge, Iowa, for Tobin Packing Co., to Ceco Steel Products Corp., Omaha, Neb.; W. A. Klinger, Sioux City, Iowa, contractor; bids Jan. 15.

125 tons, expansion, Greencastle, Ind., for Lone Star Cement Co., to Carnegie-Illinois Steel Corp., Chicago; MacDonald Engineering Co., Chicago, contractor.

100 tons, addition, Skokie, Ill., for G. D. Searle & Co., to Concrete Steel Co., Chicago; George A. Fuller Co., Chicago, contractor.

100 tons, Sinclair & Valentine building, Chi-

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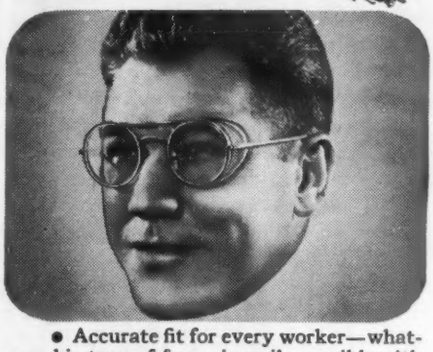

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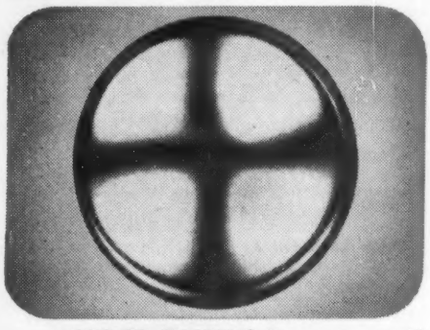

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cago, to Concrete Steel Co., Chicago; Austin Co., Chicago, contractor.

REINFORCED BARS PENDING

450 tons, highway work in Cowlitz and Clallam counties, Washington; bids opened at Olympia, Feb. 14.

350 tons, Harms road sewer, Glenview and Morton Grove, Ill., for Chicago Sanitary District; bids Feb. 14.

Unstated, 356 foot concrete bridge over Wenatchee river, Washington; bids to Olympia, Feb. 26.

PLATES . . .

PLATES PLACED

1345 tons, eight tanks, Port Everglades, Fla., for Pure Oil Co., to Hammond Iron Works, Warren, Pa.; bids Jan. 7.

246 tons, seven tanks, Richmond, Va., for Pure Oil Co., to Hammond Iron Works, Warren, Pa.; bids Jan. 7.

PIPE . . .

CAST IRON PIPE PLACED

209 tons for Metzger water district, Portland, to H. G. Purcell for U. S. Pipe & Foundry Co., Burlington, N. J.

CAST IRON PIPE PENDING

Unstated, 2180 ft. 20-inch and 1000 ft. 12-inch for Tacoma, Wash.; bids Feb. 11.

Unstated, 5800 ft. 6-inch hydrants and valves. District 49, King county, Washington; bids to F. D. Prater, secretary, Feb. 19.

Unstated, 4 and 6-inch cast iron pipe for Vancouver, Wash.; bids in Feb. 13.

RAILS, CARS . . .

RAILROAD CARS PLACED

New York, New Haven & Hartford, 75 caboose cars, to Harlan & Hollingsworth Corp., Wilmington, Del.

Pennsylvania, 57 passenger train cars, to Berwick, Pa., shops of American Car & Foundry Co., New York.

LOCOMOTIVES PLACED

Pennsylvania, one 6000-horsepower diesel-electric locomotive, to Baldwin Locomotive Works, Philadelphia.

Senate Committee Studies Steel Pricing Problem

(*Continued from Page 63*)

Falls, Pa., told the committee. Today's costs bring a loss of $10 to $12 per ton of carbon seamless tubing. The whole industry was losing money all during 1945, and during the third quarter the net losses averaged over $10 per ton. "Bear in mind," said Mr. Livingstone, "that these figures included National Tube Co. and Pittsburgh Steel Co., both integrated producers."

Mr. Livingstone protested against OPA's cost absorption policy on the ground that it is unsound. "Along in May, 1945," he said, "the OPA gave an advance of $4 per ton to our suppliers of tube rounds, but would not increase our selling prices to correspond." When the

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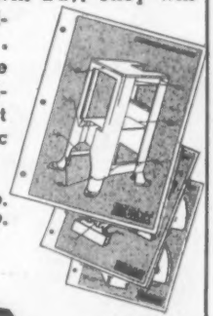

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tubing manufacturers reported losses, he said, the OPA requested more figures and since has delayed action for various reasons.

A number of small manufacturers told the committee they fear being squeezed out of business because their business is unprofitable to steel producers under recent OPA policies.

Max L. Rysdon, president, Sioux Steel Co., Sioux Falls, S. Dak., whose firm employs 120 men in the production of galvanized sheet metal products, related how he will have to reduce employment to 90 men unless he is able to obtain more steel tonnage than he has so far been able to place on mill books. Increased costs of labor and zinc in the production of galvanized sheets, Mr. Rysdon said, make business from a firm like his unattractive to a mill, especially when the mill can dispose of its entire galvanized sheet production through fabricating subsidiaries at $250 to $280 a ton in contrast to selling to independent fabricators at $74 a ton.

Other fabricating consumers explained to the committee the unhappy position in which they find themselves with respect to steel supply because of the unrealistic pricing policies of OPA. M. T. Bentzen, president, Central Metal Ware Co., Minneapolis, manufacturer of galvanized pails, etc., related that his products still are selling under ceiling prices established in 1942 whereas he has had to absorb a $2 per ton steel price increase, has raised wages by 40 per cent, the freight rate on steel to his plant has been upped $1.20 per ton, and in addition he has had to buy steel out of warehouse stocks at much higher prices than he would have had to pay had he been able to obtain supplies from the mills.

CONSTRUCTION AND ENTERPRISE

OHIO

AKRON—Ken Tool Mfg. Co., 768 East North St., J. E. Lydle, manager, will build an addition 57 x 130 feet, costing about $20,000.

AKRON—G. I. Machine Co., 50 East Springfield Rd., Barberton, O., has bought site at 12020 Home Ave., for a machine shop 30 x 80 feet, to cost about $14,000.

ASHTABULA, O.—Ashtabula Industrial Corp., R. S. Morrison, president, plans erection of two plant buildings to cost about $125,000.

CLEVELAND—Atlas Steel & Supply Co., 4401 Trumbull Ave., will build a warehouse 60 x 200 feet, to cost $50,000. Equipment includes 10-ton crane. Maurice B. Abrams is president and treasurer.

CLEVELAND—Snapin Products Co., machinery manufacturer, 10626 St. Clair Ave., plans factory and office building at Detroit Ave. and West 47th St., 90 x 135 feet. John Tekavec is in charge.

CLEVELAND—Catho-Lux Inc. has been incorporated to manufacture cold-cathode lamps, fixtures and electrical equipment. Peter E. Klein, Union Commerce Bldg., is attorney in charge of organizing.

CLEVELAND—Curtis Lock & Key Co., 1130 East 222nd St., manufacturer of screw machine products, will build an addition 50 x 100 feet and install additional die casting and other equipment.

CLEVELAND—American Iron & Metal Co., 8700 Bessemer Ave., will build a warehouse at 8650 Bessemer Ave., to cost about $12,000.

CLEVELAND—Gabriel Co., 1407 East 40th St., John Briggs, president, will double capacity for manufacture of automobile shock absorbers to 24,000 units daily. Additional capital is being raised to cover cost. Equipment costing about $300,000 will be installed in leased government-owned plant at Darley Ave. and East 140th St.

COLUMBUS, O.—Columbus Plastic Products Co., 519 Dublin Ave., has plans by A. F. Tyman, 387 East Broad St., for a plant building at 1625 West Mound St., to cost about $120,000.

NORWALK, O.—Fisher Auto Top Co., William M. Ernst, president, plans an addition of 8500 square feet to permit rearrangement and enlargement of manufacturing operations.

SMITHVILLE, O.—Troyer Singer will build $15,000 addition to machine shop on Main St.

MASSACHUSETTS

FRAMINGHAM, MASS.—General Motors Corp., Framingham, will build a power plant, including boilers, to cost about $40,000. Albert Kahn Associated Architects & Engineers Inc., 345 New Center Bldg., Detroit, is consulting engineer.

LYNN, MASS.—Signal Mfg. Co., 587 Washington St., will build a one-story plant building 80 x 185 feet, to cost about $65,000. M. F. Coombs, 56 Central Ave., is architect.

MICHIGAN

DETROIT—Atlas Gas Burner Mfg. Inc., 1837 Gratiot Ave., has been incorporated with $50,000 capital to manufacture gas conversion burners, by Max Wolf, 2545 Glynn Court, Detroit.

DETROIT—Crew's Die Casting Corp., 453 Beaufait Ave., has been incorporated with $50,000 capital to do general manufacturing and die casting, by Fred Crew, same address.

DETROIT—Excelwel Mfg. Co. Inc., 504 Stephenson Bldg., has been incorporated with $50,000 capital, to manufacture machine parts and stampings, by James A. Nagy, same address.

DETROIT—Royal Master Appliance Co., 8095 Livernois Ave., has been incorporated with $100,000 capital to manufacture electrical household appliances, by Allan A. Secter, Detroit-Leland Hotel, Detroit.

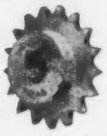
DETROIT—State Pattern Works Inc., 16 Sproat St., has been incorporated with $50,000 capital to manufacture metal and wood patterns, by Arthur G. Lewis, 17140 Mendota Ave., Detroit.

HAZEL PARK, MICH.—Trio Pattern & Mfg. Co. Inc., 1661 East Nine Mile Rd., has been incorporated with $25,000 capital to manufacture patterns, machinery and parts, by Arland Stockdale, 18666 Greenview Ave., Detroit.

JACKSON, MICH.—Dependable Products Inc., 201 McDavitt St., has been incorporated with $25,000 capital to manufacture metal products, by A. J. LaCombe, same address.

PETOSKEY, MICH.—Petoskey Mfg. Co., 112 Michigan Ave., has been incorporated with

Sprockets THAT RUN TRUE



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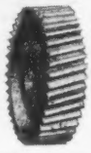

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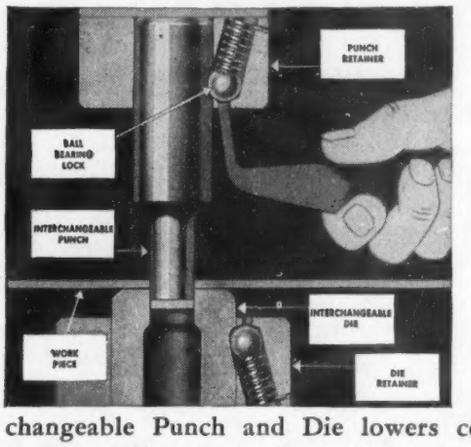

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ILLINOIS

CHARLESTON, ILL.—Charleston Industries Inc. will let contract soon for a foundry, bids to Charleston Chamber of Commerce, G. R. Caughren, secretary.

CHICAGO—Standard Transformer Corp., 1500 North Halsted St., has let contract to Clearing Industrial District, 6455 South Central Ave., for a one and two-story plant and office building, estimated to cost $500,000. J. S. Cromelin, 6455 South Central Ave., is architect.

SPRINGFIELD, ILL.—St. Johns Sanitorium, Sangamon Ave. Rd., has let contract to Franklin-Ceady Co., 101 North Fifth St., for a 67 x 121-foot power plant, estimated to cost $300,000.

INDIANA

EAST CHICAGO, IND.—St. Clair Refining Co., 3500 Indianapolis Blvd., plans an oil refinery addition and modernization of plant, to cost about $3 million.

INDIANAPOLIS—Jacobs & Co., W. L. Line, manager, has let contract to William P. Jungclaus Co., 825 Massachusetts Ave., for two one and two-story factory buildings 138 x 175 feet, estimated to cost about $400,000. Allen & Kelley, 435 Architects & Builders Bldg., are architects.

INDIANAPOLIS—Indianapolis Power & Light Co., Electric Bldg., will let contract soon for a one-story 102 x 190-foot power house superstructure to cost about $350,000. Gibbs & Hill, Pennsylvania Station, New York, are engineers.

ALABAMA

BIRMINGHAM—Southern Natural Gas Co. has bought old county courthouse site for $525,000 and will build 10 to 12-story building costing $1,500,000, which will be shared with Alabama Gas Co. and Birmingham Gas Co.

BIRMINGHAM—Southland Mower Co., organized here last August, will locate its plant at Selma, Ala., for manufacture of hand and power mowers.

HUNTSVILLE, ALA.—General Fluid Machinery Co. has been organized by Douglas Johnston, president and William H. Johnston, secretary-treasurer, to manufacture a new type of deep-well pumping equipment.

MISSOURI

ST. LOUIS—S. Pfeiffer Mfg. Co., 3847 Laclede Ave., has let contract to A. B. Darr, 4976 Eichelberger Ave., for a three-story 195 x 212-foot plant, to cost over $100,000, including equipment. B. Luer, 683 Tuxedo Ave., Webster Groves, Mo., is architect.

WISCONSIN

APPLETON, WIS.—Pierce Auto Body Works, 315 South Pierce Ave., has let contract to Oscar Boldt Construction Co., 217 South Badger Ave., for a one-story 70 x 115-foot automobile body shop.

MINNESOTA

MINNEAPOLIS—Armco Drainage & Metal Products Inc., 171 27th Ave SE, has let contract to A. Cedarstrand Co., 966 Central Ave., for a 160 x 200-foot factory and office building to cost about $150,000.

MINNEAPOLIS—Midwest Electric Co., W. C. Carlson, president, 211 South Third St., has let contract to C. O. Field Co., 2940 Harriet Ave., for a two-story 66 x 110-foot warehouse and office to cost $100,000.

TEXAS

DALLAS, TEX.—J. W. Bateson, Irwin-Keasler Bldg., will build a machine shop costing about $45,000.

DALLAS, TEX.—Browning-Ferris Machinery Co., 305 Exposition St., has let contract to Cedric Burgher Construction Co., 3027 Main St., for a factory unit costing about $40,000.

HOUSTON, TEX.—Baker Oil Tool Co., 6022 Navigation Blvd., has let contract to Linbeck & Dederick, 1523 Peden St., for a two-story tool storage shop costing about $60,000. MacKie & Kamrath, 1532 Peden St., are architects.

CALIFORNIA

HUNTINGTON PARK, CALIF.—Industrial Sheet Metal Co. is building a sheet metal plant at 2639 East 52nd St., 58 x 144 feet, to cost $25,000.

LONG BEACH, CALIF.—Akeyson Tool & Engineering Corp. has been formed with $50,000 capital, represented by Newton M. Todd, 620 Security Bldg.

LOS ANGELES—Magnesium Products Inc., 1119 Santa Fe Ave., has permit for warehouse building 80 x 120 feet at 3020 Sacramento St., to cost about $33,000.

LOS ANGELES—Alvin Ellison is building a machine shop at 11156 Avalon Blvd., 48 x 90 feet, to cost about $9000.

LOS ANGELES—H. A. Deele, 2311 Southwest Dr., will build a machine shop 35 x 110 feet, to cost about $11,000.

LOS ANGELES—California Cold Rolled Steel Corp., 7130 Anaheim-Telegraph Rd., has building permit for addition 55 x 105 feet, to cost about $14,000.

LOS ANGELES—B. & B. Metals Co. has been formed by Robert A. Stockmar and Robert C. Smith and has established operations at 2911 East Pico Blvd.

LOS ANGELES—Ross-Carter Mfg. Co. has been organized by Harry F. Ross and John W. Carter and has started operations at 1212 North Bronson Ave., in manufacture of steel and metal-frame houses.

LOS ANGELES—McKenzie Metal Engineering Co. has been formed by Herbert W. McKenzie and is conducting a metal fabricating business at 947 Kohler St.

PASADENA, CALIF.—Latisteel Inc., 3272 East Foothill Blvd., will build three one-story additions, 43 x 52 feet, 38 x 40 feet and 40 x 85 feet, to cost about $25,000.

REDLANDS, CALIF.—Aviation Maintenance Corp. has been incorporated with $800,000 capital, represented by San C. A. Smith, 203 Hubbars Bldg., Redlands.

SAN DIEGO, CALIF.—International Aviation Inc. has been organized with 2000 shares no par value, represented by William T. Macomber, San Diego Trust & Savings Bldg.

VENICE, CALIF.—Aviation Products Co. is building a plant at 4221 Lincoln Blvd. containing 7800 square feet floor space, to cost $15,000.

VERNON, CALIF.—Electric Tool & Supply Co. is building a plant at 30th St. and Santa Fe Ave., to cost about $30,000.

OREGON

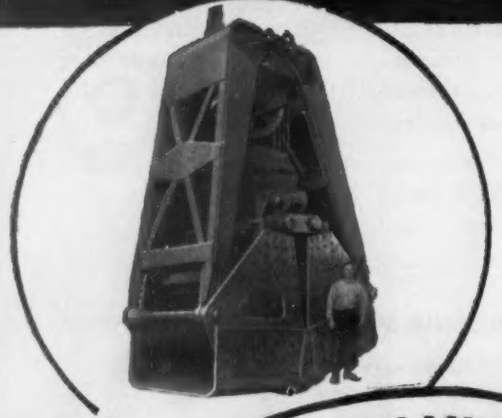
PORTLAND, OREG.—Northern Pacific Terminal Co. is building a powerhouse at Guilds Lake coach yard, to cost about $25,000, general contract let to James & Yost. Project will cost about $60,000, including boilers let to C. C. Moore & Co.

PORTLAND, OREG.—Pacific Wire Rope Co. plans an 80 x 125-foot warehouse at 1223 NW St. Helens Rd., to cost $50,000. Plans are by Claussen & Claussen, architects.

WASHINGTON

SEATTLE—Northwest Construction Co. has had plans drawn for a machine shop at 3960 Sixth Ave. NW, to cost about $22,000.

ERIE BUCKETS



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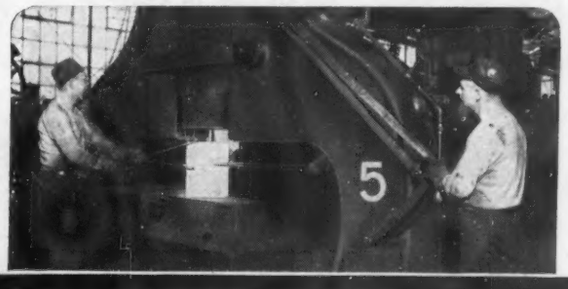

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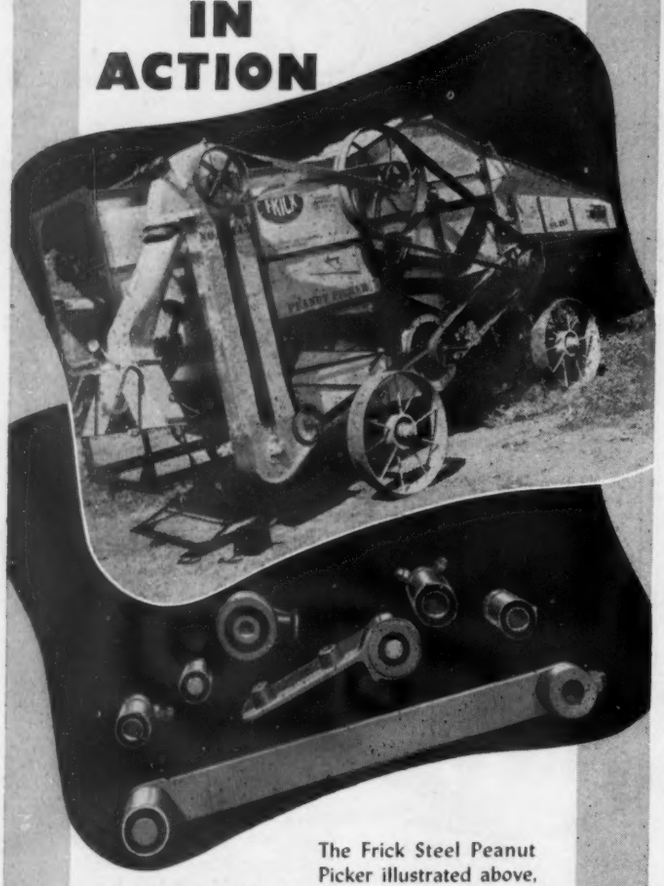

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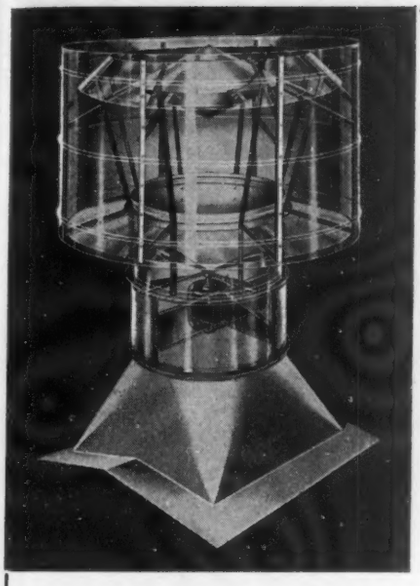

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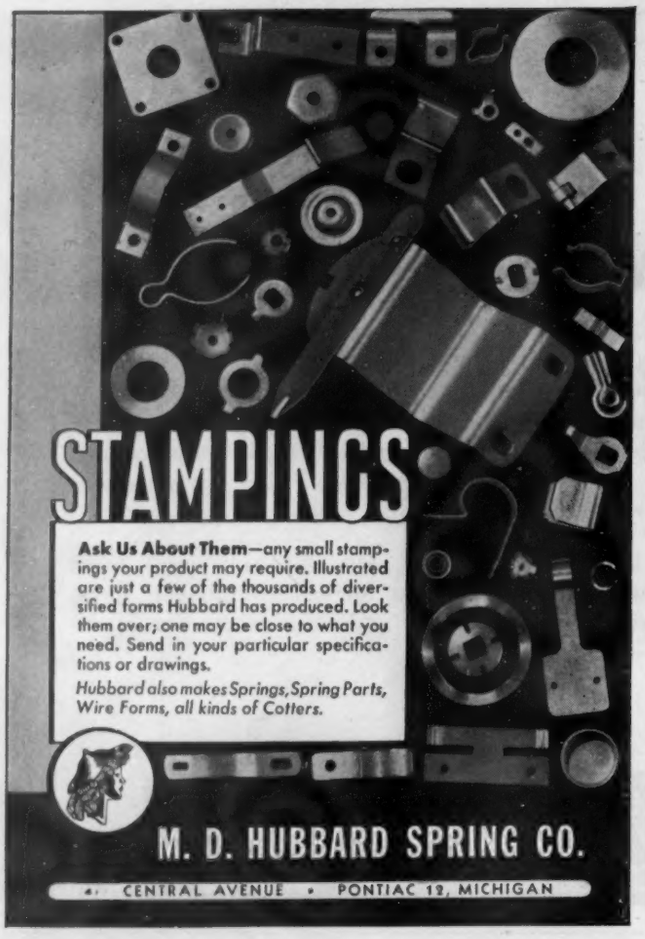

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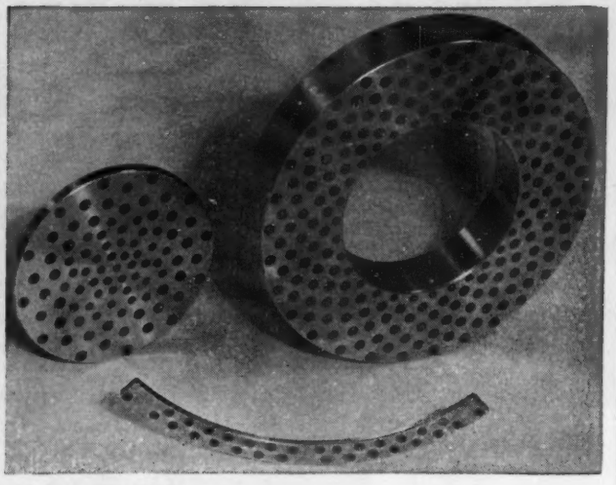

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13/16"	883 "
15/16"	1,716 "
⅞"	8,895 "
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1¼"	1,060 "
1 3/16"	3,573 "
2⅛"	1,020 "
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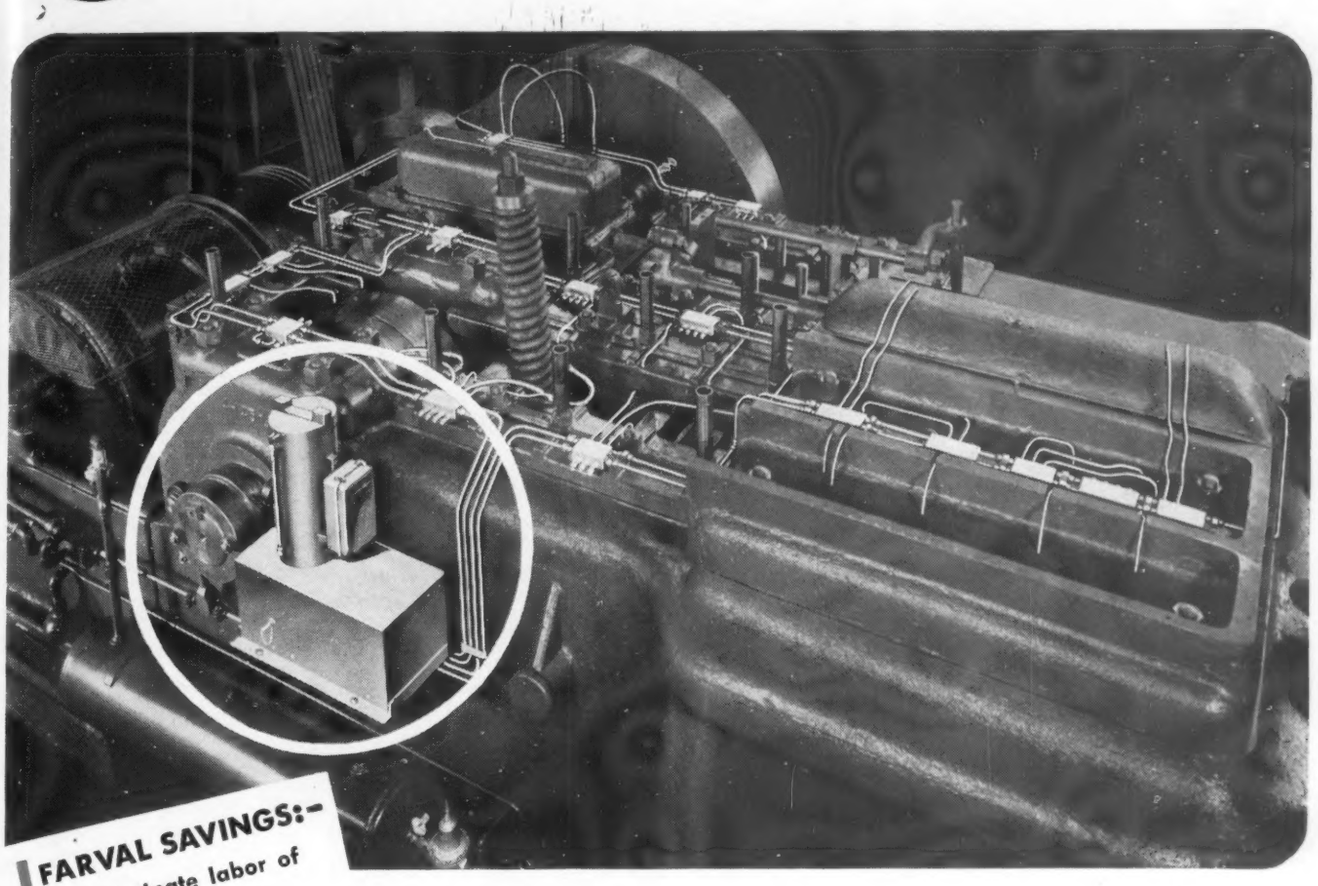

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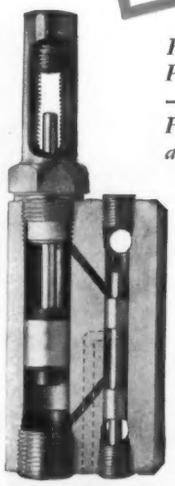

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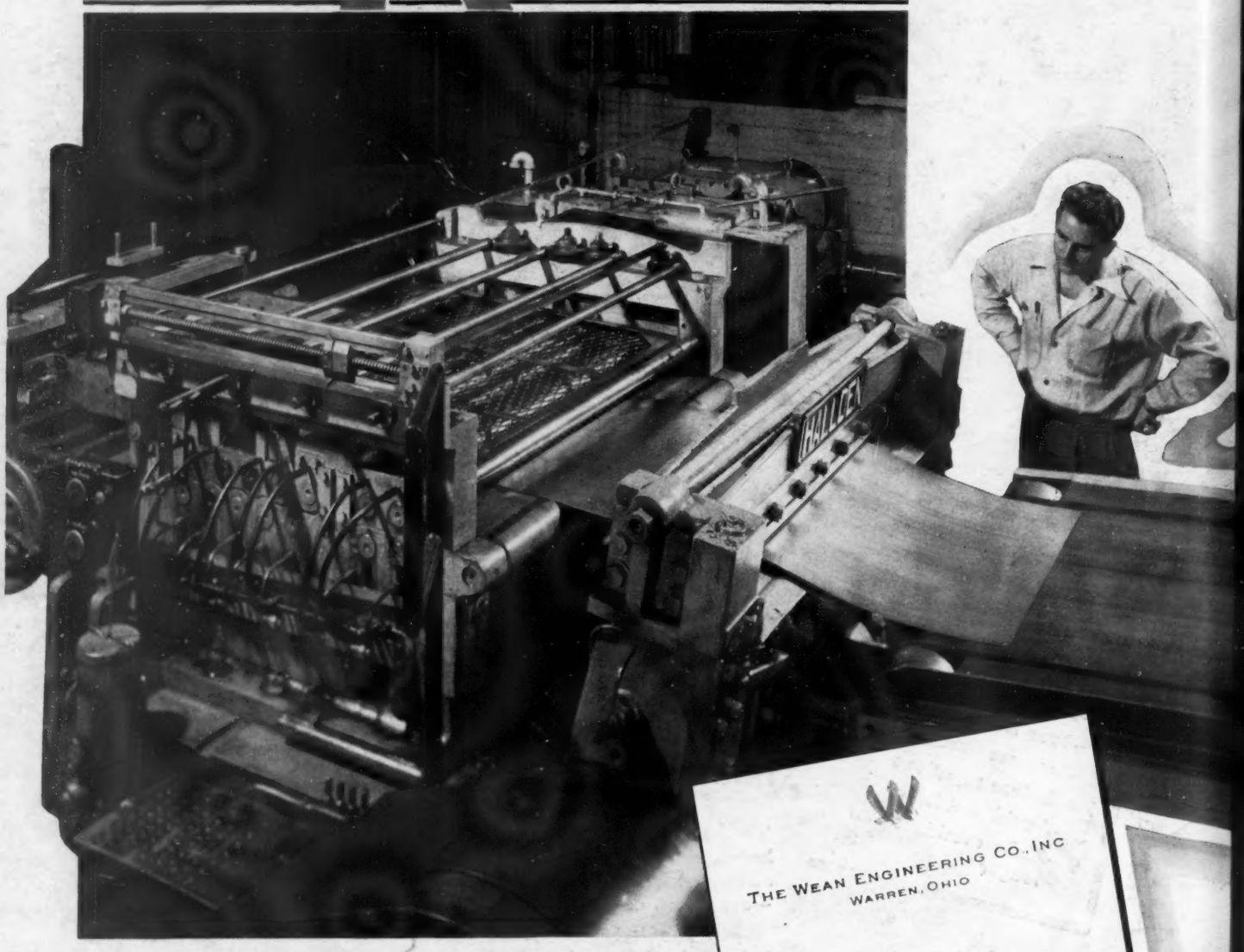

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